SCOPE OF WORK

Data Center Power Distribution System Improvements

NJ State Police Technology Complex
Hamilton Township, Mercer County, N.J.

Project No. A1236-00

STATE OF NEW JERSEY

Honorable Chris Christie, Governor
Honorable Kim Guadagno, Lt. Governor

DEPARTMENT OF THE TREASURY

Ford M. Scudder, Treasurer

DIVISION OF PROPERTY MANAGEMENT AND CONSTRUCTION

Christopher Chianese, Director

Date: 3-6-17

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I. OBJECTIVE

The objective of this project is to improve the reliability of the power distribution system in the Office of Information Technology's data center, located in the NJ State Police Technology Complex, by adding additional uninterruptable power supply systems (UPS's), switchgear, power distribution units (PDU's), new distribution panels and associated equipment and rewiring power to existing equipment.

II. CONSULTANT QUALIFICATIONS

A. CONSULTANT & SUB-CONSULTANT PRE-QUALIFICATIONS

The Consultant shall be a firm pre-qualified with the Division of Property Management & Construction (DPMC) in the following discipline:

- **P002 Electrical Engineering**

The Consultant shall also have in-house capabilities or Sub-Consultants pre-qualified with DPMC in:

- **P001 Architecture**
- **P025 Estimating/ Cost Analysis**

As well as, **any and all** other Architectural, Engineering and Specialty Disciplines necessary to complete the project as described in this Scope of Work (SOW).

III. PROJECT BUDGET

A. CONSTRUCTION COST ESTIMATE (CCE)

The initial Construction Cost Estimate (CCE) for this project is $ 5,350,000.

The Consultant shall review this Scope of Work and provide a narrative evaluation and analysis of the accuracy of the proposed project CCE in their technical proposal based on their professional experience and opinion.

B. CURRENT WORKING ESTIMATE (CWE)

The Current Working Estimate (CWE) for this project is $ 6,716,000.

The CWE includes the construction cost estimate and all consulting, permitting and administrative fees.

The CWE is the Client Agency's financial budget based on this project Scope of Work and shall not be exceeded during the design and construction phases of the project unless DPMC approves the change in Scope of Work through a Contract amendment.

C. CONSULTANT'S FEES

The construction cost estimate for this project ***shall not*** be used as a basis for the Consultant's design and construction administration fees. The Consultant's fees shall be based on the information contained in this Scope of Work document and the observations made and/or the additional information received during the pre-proposal meeting.

IV. PROJECT SCHEDULE

A. SCOPE OF WORK DESIGN & CONSTRUCTION SCHEDULE

The following schedule identifies the estimated design and construction phases for this project and the estimated durations.

PROJECT PHASE		ESTIMATED DURATION (Calendar Days)
1. Site Access Approvals & Schedule Design Kick-off Meeting		**14**
2. Schematic Design Phase	**25% (Minimum)**	**28**
• *Project Team & DPMC Plan/Code Unit Review & Comment*		14
3. Design Development Phase	**50% (Minimum)**	**28**
• *Project Team & DPMC Plan/Code Unit Review & Comment*		14
4. Final Design Phase	**100%**	**28**
• *Project Team & DPMC Plan/Code Unit Review & Approval*		14
5. Permit Application Phase		**7**
• *Issue Plan Release*		
6. Bid Phase		**42**
7. Award Phase		**28**
8. Construction Phase		**300**

B. CONSULTANT'S PROPOSED DESIGN & CONSTRUCTION SCHEDULE

The Consultant shall submit a project design and construction bar chart schedule with their technical proposal that is similar in format and detail to the schedule depicted in **Exhibit 'A'**. The bar chart schedule developed by the Consultant shall reflect their recommended project phases, phase activities, activity durations.

The Consultant shall estimate the duration of the project Close-Out Phase based on the anticipated time required to complete each deliverable identified in Section XIV of this document entitled "Contract Deliverables - Project Close-Out Phase" and include this information in the bar chart schedule submitted.

A written narrative shall also be included with the technical proposal explaining the schedule submitted and the reasons why and how it can be completed in the time frame proposed by the Consultant.

This schedule and narrative will be reviewed by the Consultant Selection Committee as part of the evaluation process and will be assigned a score commensurate with clarity and comprehensiveness of the submission.

C. CONSULTANT DESIGN SCHEDULE

Based on the Notice to Proceed, Consultant shall update their approved schedule and shall distribute it at the design kickoff meeting. Note that this schedule shall be submitted in both paper format and on compact disk in a format compatible with *Microsoft Project*. This schedule will be binding for the Consultant's activities and will include the start and completion dates for each design activity. The Consultant and Project Team members shall use this schedule to ensure that all design milestone dates are being met for the project. The Consultant shall update the schedule to reflect performance periodically (minimally at each design phase) for the Project Team review and approval. Any recommendations for deviations from the approved design schedule must be explained in detail as to the causes for the deviation(s) and impact to the schedule.

D. BID DOCUMENT CONSTRUCTION SCHEDULE

The Consultant shall include a construction schedule in Division 1 of the specification bid document. This schedule shall contain, at minimum, the major activities and their durations for each trade specified for the project. This schedule shall be in "bar chart" format and will be used by the Contractors as an aid in determining their bid price. It shall reflect special sequencing or phased construction requirements including, but not limited to: special hours for building access,

weather restrictions, imposed constraints caused by Client Agency program schedules, security needs, lead times for materials and equipment, anticipated delivery dates for critical items, utility interruption and shut-down constraints, and concurrent construction activities of other projects at the site and any other item identified by the Consultant during the design phases of the project.

E. CONTRACTOR CONSTRUCTION PROGRESS SCHEDULE

The Contractor shall be responsible for preparing a coordinated combined progress schedule with the Sub-Contractors after the award of the contract. This schedule shall meet all of the requirements identified in the Consultant's construction schedule. The construction schedule shall be completed in accordance with the latest edition of the Instructions to Bidders and General Conditions and Bulletins that may be issued on the project.

The Consultant must review and analyze this progress schedule and recommend approval/disapproval to the Project Team until a satisfactory version is approved by the Project Team. The Project Team must approve the baseline schedule prior to the start of construction and prior to the Contractor submitting invoices for payment.

The Consultant shall note in Division 1 of the specification that the State will not accept the progress schedule until it meets the project contract requirements and any delays to the start of the construction work will be against the Contractor until the date of acceptance by the State.

The construction progress schedule shall be reviewed, approved, and updated by the Contractor, Consultant, and Project Team members at each regularly scheduled construction job meeting and the Consultant shall note the date and trade(s) responsible for project delays (as applicable).

V. PROJECT SITE LOCATION & TEAM MEMBERS

A. PROJECT SITE ADDRESS

The location of the project site is:

NJ State Police Technology Complex
1200 Negron Drive
Hamilton Township, N.J. 08691

See **Exhibit 'B'** for the project site plan.

B. PROJECT TEAM MEMBER DIRECTORY

The following are the names, addresses, and phone numbers of the Project Team members.

1. DPMC Representative:

Name: Richard Herrero, Design Project Manager
Address: Division Property Management & Construction
20 West State Street, 3rd Floor
Trenton, NJ 08608-1206
Phone No: (609) 292-6558
E-Mail No: Richard.Herrero@treas.nj.gov

2. OIT Representative:

Name: Michael Chianese, Manager
Address: Office of Information Technology
300 Riverview Plaza
Trenton, NJ 08611
Phone No: 609-292-0039
E-Mail No: michael.chianese@tech.nj.gov

VI. PROJECT DEFINITION

A. BACKGROUND

The Office of Information and Technology's data center power distribution system has many points of failure that need to be eliminated.

The Office of Information and Technology (OIT) engaged *EI Associates, Architects & Engineers, PA* (EI) to study methods to improve the reliability of the power distribution system. EI prepared a report titled "Electrical Power Distribution Optimization", dated September 14, 2015 that is the basis of this scope of work, refer to **Exhibit "C"**.

B. FUNCTIONAL DESCRIPTION OF THE BUILDING

The data center is located in the NJSP Technology Complex. The building is 195,000 sf and houses the New Jersey State Police Crime Laboratory, FBI-Regional Computer Forensic Laboratory, The Office of Counter Terrorism, The Office of Information and Technology Disaster Recovery Unit, and other various state agencies.

The OIT Data Center operates 24 hours a day every day of the year.

VII. CONSULTANT DESIGN RESPONSIBILITIES

A. ELECTRIC POWER DISTRIBUTION

Refer to **Exhibit 'C'**, "Electrical Power Distribution Optimization" report.

Consultants shall provide construction documents to include all work noted on Page 7 of the report, "Recommendations to improve reliability" and all work under "Future load increase" noted on Pages 7 & 8 of the report including all building modifications required to accommodate the new equipment.

Consultant shall verify the existing equipment configuration, wire sizes and capacities.

Consultant shall verify the proposed location of all new equipment and confirm that the equipment fits in the locations proposed and meets all the requirements of the NJ Uniform Construction Code (UCC).

B. EMERGENCY GENERATOR

Construction documents shall include an emergency generator to support the equipment noted under "Future load increase". Note that this generator is not identified in the "Electrical Power Distribution Optimization" report.

Consultant shall size the generator based on the capacity of the new equipment.

Consultant shall determine the location of the emergency generator. Construction documents shall include, but are not limited to, pad for the generator, fencing to secure the generator if required, conduit and wiring and all required connections.

C. PHASING PLAN

In consultation with OIT staff, consultant shall develop and include in the construction documents a phasing plan to include all work. The objective of the phasing plan is to minimize the impact of the work on OIT's ongoing operations.

The phasing plan shall include all requirements and notifications the contractor must comply with to shut down electric power. This may require the use of a temporary generator or other temporary electrical equipment.

D. GENERAL DESIGN OVERVIEW

1. Design Detail:

Section VII of this Scope of Work is intended as a guide for the Consultant to understand the overall basic design requirements of the project and is not intended to identify each specific design component related to code and construction items. The Consultant shall provide those details during the design phase of the project ensuring that they are in compliance with all applicable codes, regulating authorities, and the guidelines established in the DPMC Procedures for Architects and Engineers Manual.

The Consultant shall understand that construction documents submitted to DPMC shall go beyond the basic requirements set forth by the current copy of the Uniform Construction Code N.J.A.C. 5:23-2.15(f). Drawings and specifications shall provide detail beyond that required to merely show the nature and character of the work to be performed. The construction documents shall provide sufficient information and detail to illustrate, describe and clearly delineate the design intent of the Consultant and enable all Contractors to uniformly bid the project.

The Consultant shall ensure that all of the design items described in this scope of work are addressed and included in the project drawings and specification sections where appropriate.

It shall be the Consultant's responsibility to provide all of the design elements for this project. Under no circumstance may they delegate the responsibility of the design; or portions thereof, to the Contractor unless specifically allowed in this Scope of Work.

2. Specification Format:

The Consultant shall prepare the construction specifications in the Construction Specifications Institute (CSI) format entitled MasterFormat©, latest edition.

The project construction specifications shall include only those CSI MasterFormat© specification sections and divisions applicable to this specific project.

3. Submittal Schedule:

The Consultant shall include a submittal schedule in Division 1 of the specifications. The schedule (list of required submittals) shall identify the general conditions and/or specification section (number and name) and the type of submittal required (material data, product data, test results, calculations, etc.). The submittal schedule is a compilation of the submittals required on the project and is provided as an aid to the contractor.

4. Construction Cost Estimates:

The Consultant shall include with each design submittal phase identified in Paragraph IV.A, including the Permit Application Phase and Bid Phase, a detailed construction cost estimate itemized and summarized by the divisions and sections of the Construction Specification Institute (CSI) MasterFormat© 2014 applicable to the project.

The detailed breakdown of each work item shall include labor, equipment, material and total costs.

The construction estimate shall include all alternate bid items and all unit price items itemized and summarized by the divisions and sections of the specifications.

All cost estimates shall be adjusted for regional location, site factors, construction phasing, premium time, building use group, location of work within the building, temporary swing space, security issues, and inflation factors based on the year in which the work is to be performed.

The cost estimate shall include descriptions of all allowances and contingencies noted in the estimate.

All cost estimates must be submitted on a DPMC-38 Project Cost Analysis form at each design phase of the project supported by the detailed construction cost estimate. The Project Manager will provide cost figures for those items which may be in addition to the CCE such as art inclusion, CM services, etc. and must be included as part of the CWE. This cost analysis must be submitted for all projects regardless of the Construction Cost Estimate amount.

E. PROJECT COMMENCEMENT

A pre-design meeting shall be scheduled with the Consultant and the Project Team members at the commencement of the project to obtain and/or coordinate the following information:

1. Project Directory:

Develop a project directory that identifies the name and phone number of key designated representatives who may be contacted during the design and construction phases of this project.

2. Site Access:

Develop procedures to access the project site and provide the names and phone numbers of approved escorts when needed. Obtain copies of special security and policy procedures that must be followed during all work conducted at the facility and include this information in Division 1 of the specification.

3. Project Coordination:

Review and become familiar with any current and/or future projects at the site that may impact the design, construction, and scheduling requirements of this project. Incorporate all appropriate information and coordination requirements in Division 1 of the specification.

4. Existing Documentation:

Review and any additional information that may be provided at a later date such as reports, studies, surveys, equipment manuals, as-built drawings, etc. The State does not attest to the accuracy of the information provided and accepts no responsibility for the consequences of errors by the use of any information and material contained in the documentation provided. It shall be the responsibility of the Consultant to verify the contents and assume full responsibility for any determination or conclusion drawn from the material used. If the information provided is insufficient, the Consultant shall take the appropriate actions necessary to obtain the additional information required.

All original documentation shall be returned to the provider at the completion of the project.

5. Scope of Work:

Review the design and construction administration responsibilities and the submission requirements identified in this Scope of Work with the Project Team members. Items such as: contract deliverables, special sequencing or phased construction requirements, special hours for construction based on Client Agency programs or building occupancy, security needs, delivery dates of critical and long lead items, utility interruptions or shut down constraints for tie-ins, weather restrictions, and coordination with other project construction activities at the site shall be addressed.

This information and all general administrative information; including a narrative summary of the work for this project, ***shall be included in Division 1*** of the specification. The Consultant shall assure that there are no conflicts between the information contained in Division 1 of the specification and the DPMC General Conditions.

6. Project Schedule:

Review and update the project design and construction schedule with the Project Team members.

F. BUILDING & SITE INFORMATION

The following information shall be included in the project design documents.

1. Building Classification:

Provide the building Use Group Classification and Construction Type on the appropriate design drawing.

2. Building Block & Lot Number:

Provide the site Block and Lot Number on the appropriate design drawing.

3. Building Site Plan:

Only when the project scope involves site work, or when the design triggers code issues that require site information to show code compliance, shall a site plan be provided that is drawn in accordance with an accurate boundary line survey. The site plan shall include, but not be limited to, the following as may be applicable:

- The size and location of new and existing buildings and additions as well as other structures.
- The distance between buildings and structures and to lot lines.
- Established and new site grades and contours as well as building finished floor elevations.
- New and existing site utilities, site vehicular and pedestrian roads, walkways and parking areas.

4. Site Location Map:

Provide a site location map on the drawing cover sheet that identifies the vehicular travel routes from major roadways to the project construction site and the approved access roads to the Contractor's worksite staging area.

G. DESIGN MEETINGS & PRESENTATIONS

1. Design Meetings:

Conduct the appropriate number of review meetings with the Project Team members during each design phase of the project so they may determine if the project meets their requirements, question any aspect of the contract deliverables, and make changes where appropriate. The Consultant shall describe the philosophy and process used in the development of the design criteria and the various alternatives considered to meet the project objectives. Selected studies, sketches, cost estimates, schedules, and other relevant information shall be presented to support the design solutions proposed. Special considerations shall also be addressed such as: Contractor site access limitations, utility shutdowns and switchover coordination, phased construction and schedule requirements, security restrictions, available swing space, material and equipment delivery dates, etc.

It shall also be the responsibility of the Consultant to arrange and require all critical Sub-Consultants to be in attendance at the design review meetings.

Record the minutes of each design meeting and distribute within seven (7) calendar days to all attendees and those persons specified to be on the distribution list by the Project Manager.

2. Design Meetings/Presentations:

The minimum number of design meeting/presentations required for each phase of this project is identified below for reference:

50% Schematic Phase: Conduct one (1) working meeting.

Schematic Phase: One (1) oral presentation at phase completion.

50% Design Development Phase: Conduct one (1) working meeting.

Design Development Phase: One (1) oral presentation at phase completion.

50% Final Design Phase: Conduct one (1) working meeting.

Final Design Phase: One (1) oral presentation at phase completion.

Note that all design meetings and presentations shall take place at the Hamilton Technology Complex.

H. CONSTRUCTION BID DOCUMENT SUBMITTAL

In addition to submitting construction bid documents as defined in Section XIV Contract Deliverables, Consultant shall submit both specifications and drawings on compact disk (CD) in *Adobe Portable Document Format (.pdf).*

VIII.CONSULTANT CONSTRUCTION RESPONSIBILITIES

A. GENERAL CONSTRUCTION ADMINISTRATION OVERVIEW

This section of the Scope of Work is intended as a guide for the Consultant to understand their overall basic construction administration responsibilities for the project and does not attempt to identify each specific activity or deliverable required during this phase. The Consultant shall obtain that information from the current publication of the DPMC Procedures for Architects and Engineers Manual and any additional information provided during the Consultant Selection Process.

B. PRE-BID MEETING

The Consultant shall attend, chair, record and distribute minutes of the Contractor pre-bid meetings. When bidders ask questions that may affect the bid price of the project, the Consultant shall develop a Bulletin(s) to clarify the bid documents in the format described in the Procedures

for Architects and Engineers Manual, Section 9.2 entitled "Bulletins." These Bulletins must be sent to DPMC at least seven (7) calendar days prior to the bid opening date. DPMC will then distribute the document to all bidders.

C. BID OPENING

The Consultant must attend the bid opening held at the designated location.

In the event that the construction bids received exceed the Consultant's approved final cost estimate by 5% or more, the Consultant shall redesign and/or set up sufficient approved alternate designs, plans and specifications for the project work, to secure a bid that will come within the allocation specified by the State without impacting the programmatic requirements of the project. Such redesign work and changes to plans, including reproduction costs for submission in order to obtain final approval and permits, shall be undertaken by the Consultant at no additional cost to the State.

D. POST BID REVIEW MEETING, RECOMMENDATION FOR AWARD

The Consultant; in conjunction with the Project Manager, shall review the bid proposals submitted by the various Contractors to determine the low responsible bid for the project. The Consultant; in conjunction with the Project Manager and Project Team members, shall develop a post bid questionnaire based on the requirements below and schedule a post bid review meeting with the Contractor's representative to review the construction costs and schedule, staffing, and other pertinent information to ensure they understand the Scope of the Work and that their bid proposal is complete and inclusive of all requirements necessary to deliver the project in strict accordance with the plans and specifications.

1. Post Bid Review:

Review the project bid proposals including the alternates, unit prices, and allowances within seven (7) calendar days from the bid due date. Provide a bid tabulation matrix comparing all bids submitted and make a statement about the high, low, and average bids received. Include a comparison of the submitted bids to the approved current construction cost estimate. When applicable, provide an analysis with supporting data, detailing why the bids did not meet the construction cost estimate.

2. Review Meeting:

Arrange a meeting with the apparent low bid Contractor to discuss their bid proposal and other issues regarding the award of the contract. Remind the Contractor that this is a Lump Sum bid. Request the Contractor to confirm that their bid proposal does not contain errors. Review and confirm Alternate pricing and Unit pricing and document acceptance or rejection as appropriate.

Comment on all omissions, qualifications and unsolicited statements appearing in the proposals. Review any special circumstances of the project. Ensure the Contractor's signature appears on all post bid review documents.

3. Substitutions:

Inquire about any potential substitutions being contemplated by the Contractor and advise them of the State's guidelines for the approval of substitutions and the documentation required. Review the deadline and advise the Contractor that partial submissions are not acceptable. Submission after the deadline may be rejected by the State.

Equal substitutions that are proposed by the Contractor that are of lesser value must have a credit change order attached with the submittal (See Article 4.7.5 "Substitutions" of the General Conditions). The State has the right to reject the submission if there is no agreement on the proposed credit. Contractor will be responsible to submit a specified item.

4. Schedule:

Confirm that the Contractor is aware of the number of calendar days listed in the contract documents for the project duration and that the Contractor's bid includes compliance with the schedule duration and completion dates. Particular attention shall be given to special working conditions, long lead items and projected delivery dates, etc. Review project milestones (if applicable). This could give an indication of Contractor performance, but not allow a rejection of the bid.

Review the submittal timeframes per the Contract documents. Ask the Contractor to identify what products will take over twenty-eight (28) calendar days to deliver from the point of submittal approval.

If a CPM Schedule is required, review the provisions and have Contractor acknowledge the responsibility. Ask for the name of the CPM Scheduler and the "ballpark" costs.

5. Performance:

Investigate the past performance of Contractor by contacting Architects and owners (generally three of each) that were listed in their DPMC pre-qualification package and other references that may have been provided. Inquire how the Contractor performed with workmanship, schedule, project management, change orders, cooperation, paper work, etc.

6. Letter of Recommendation:

The Consultant shall prepare a Letter of Recommendation for contract award to the Contractor submitting the lowest responsible bid within three (3) calendar days from the post bid review

meeting. The document shall contain the project title, DPMC project number, bid due date and expiration date of the proposal. It shall include a detailed narrative describing each post bid meeting agenda item identified above and a recommendation to award the contract to the apparent low bid Contractor based on the information obtained during that meeting. Describe any acceptance or rejection of Alternate pricing and Unit pricing.

Comment on any discussion with the Contractor that provides a sense of their understanding of the project and any special difficulties that they see, and how they might approach those problems.

Attach all minutes of the Post bid meeting and any other relevant correspondence with the Letter of Recommendation and submit them to the Project Manager.

7. Conformed Drawings:

The Consultant shall prepare and distribute two (2) sets of drawings stamped "Conformed Drawings" to the Project Manager that reflect all Bulletins and/or required changes, additions, and deletions to the pertinent drawings within fourteen (14) calendar days of the construction contract award date.

Any changes made in Bulletins, meeting minutes, post bid review requirements shall also be reflected in the specification.

E. DIRECTOR'S HEARING

The Consultant must attend any Director's hearing(s) if a Contractor submits a bid protest. The Consultant shall be present to interpret the intent of the design documents and answer any technical questions that may result from the meeting. In cases where the bid protest is upheld, the Consultant shall submit a new "Letter of Recommendation" for contract award. The hours required to attend the potential hearings and to document the findings shall be estimated by the Consultant and the costs will be included in the base bid of their fee proposal.

F. CONSTRUCTION JOB MEETINGS, SCHEDULES, LOGS

The Consultant shall conduct all of the construction job meetings, to be held bi-weekly for the duration of construction, in accordance with the procedures identified in the A/E manual and those listed below.

1. Meetings:

The Consultant and Sub-Consultant(s) shall attend the pre-construction meeting and all construction job meetings during the construction phase of the project. The Consultant shall chair the meeting, transcribe and distribute the job-meeting minutes for every job meeting to all

attendees and to those persons specified to be on the distribution list by the Project Manager. The Agenda for the meeting shall include, but not be limited to the items identified in the Procedures for Architects and Engineers Manual, Section 10.3.1, entitled "Agenda."

Also, the Consultant is responsible for the preparation and distribution of minutes within three (3) calendar days of the meeting. The format to be used for the minutes shall comply with those identified in the "Procedures for Architects and Engineers Manual," Section 10.3.4, entitled, "Format of Minutes." All meeting minutes are to have an "action" column indicating the party that is responsible for the action indicated and a deadline to accomplish the assigned task. These tasks must be reviewed at each job progress meeting until it is completed and the completion date of each task shall be noted in the minutes of the meeting following the task completion.

2. Schedules:

The Consultant; with the input from the Client Agency Representative and Project Manager, shall review and recommend approval of the project construction schedule prepared by the Contractor. The schedule shall identify all necessary start and completion dates of construction, construction activities, submittal process activities, material deliveries and other milestones required to give a complete review of the project.

The Consultant shall record any schedule delays, the party responsible for the delay, the schedule activity affected, and the original and new date for reference.

The Consultant shall ensure that the Contractor provides a two (2) week "look ahead" construction schedule based upon the current monthly updated schedule as approved at the bi-weekly job meetings and that identifies the daily planned activities for that period. This Contractor requirement must also be included in Division 1 of the specification for reference.

3. Submittal Log:

Based on the Submittal Schedule in Division 1 of the specifications, the Consultant shall develop and implement a submittal log that includes all of the required project submittals as identified in the general conditions and technical specifications. The dates of submission shall be determined and approved by all affected parties during the pre-construction meeting.

Examples of the submissions to be reviewed and approved by the Consultant and Sub-Consultant (if required) include: project schedule, schedule of values, shop drawings, equipment and material catalog cuts, spec sheets, product data sheets, MSDS material safety data sheets, specification procedures, color charts, material samples, mock-ups, etc. The submittal review process must be conducted at each job progress meeting and shall include the Consultant, Sub-Consultant, Contractor, Project Manager, and designated representatives of the Client Agency.

The Consultant shall provide an updated submittal log at each job meeting that highlights the status of all required submissions.

G. CONSTRUCTION SITE ADMINISTRATION SERVICES

The Consultant and Sub-Consultant(s) shall provide construction site administration services during the duration of the project. The Consultant and Sub-Consultant(s) do not necessarily have to be on site concurrently if there are no critical activities taking place that require the Sub-Consultant's participation.

The services required shall include, but not be limited to; field observations sufficient to verify the quality and progress of construction work, conformance and compliance with the contract documents, and to attend/chair meetings as may be required by the Project Manager to resolve special issues.

Consultant and Sub-Consultant(s) shall conduct weekly site inspection/field observation visits. Site inspection/field observation visits may be conducted in conjunction with regularly scheduled bi-weekly construction job meetings, depending on the progress of work, for weeks that construction job meetings are scheduled. The Consultant and their Sub-Consultant(s) shall submit a field observation report for each site inspection to the Project Manager within three (3) calendar days of the site visit. Also, they shall conduct inspections during major construction activities including, but not limited to the following examples: concrete pours, steel and truss installations, code inspections, final testing of systems, achievement of each major milestone required on the construction schedule, and requests from the Project Manager. The assignment of a full time on-site Sub-Consultant does not relieve the Consultant of their site visit obligation.

The Consultant shall refer to Section XIV. Contract Deliverables of this Scope of Work subsection entitled "Construction Phase" to determine the extent of services and deliverables required during this phase of the project.

H. SUB-CONSULTANT PARTICIPATION

It is the responsibility of the Consultant to ensure that they have provided adequate hours and/or time allotted in their technical proposal so that their Sub-Consultants may participate in all appropriate phases and activities of this project or whenever requested by the Project Manager. This includes the pre-proposal site visit and the various design meetings and construction job meetings, site visits, and close-out activities described in this Scope of Work. Field observation reports and/or meeting minutes are required to be submitted to the Project Manager within three (3) calendar days of the site visit or meeting. All costs associated with such services shall be included in the base bid of the Consultant's fee proposal.

I. DRAWINGS

1. Shop Drawings:

Each Contractor shall review the specifications and determine the numbers and nature of each shop drawing submittal. Five (5) sets of the documents shall be submitted with reference made to the appropriate section of the specification. The Consultant shall review the Contractor's shop drawing submissions for conformity with the construction documents within seven (7) calendar days of receipt. The Consultant shall return each shop drawing submittal stamped with the appropriate action, i.e. "Approved", "Approved as Noted", "Approved as Noted Resubmit for Records", "Rejected", etc.

2. As-Built & Record Set Drawings:

The Contractor(s) shall keep the contract drawings up-to-date at all times during construction and upon completion of the project, submit their AS-BUILT drawings to the Consultant with the Contractor(s) certification as to the accuracy of the information prior to final payment. All AS-BUILT drawings submitted shall be entitled AS-BUILT above the title block and dated.

The Consultant shall review the Contractor(s)' AS-BUILT drawings at each job progress meeting to ensure that they are up-to-date. Any deficiencies shall be noted in the progress meeting minutes.

The Consultant shall acknowledge acceptance of the AS-BUILT drawings by signing a transmittal indicating they have reviewed them and that they reflect the AS-BUILT conditions as they exist.

Upon receipt of the AS-BUILT drawings from the Contractor(s), the Consultant shall obtain the original reproducible drawings from DPMC and transfer the AS-BUILT conditions to the original full sized signed reproducible drawings to reflect RECORD conditions within fourteen (14) calendar days of receipt of the AS-BUILT information.

The Consultant shall note the following statement on the original RECORD-SET drawings. "The AS-BUILT information added to this drawing(s) has been supplied by the Contractor(s). The Architect/Engineer does not assume the responsibility for its accuracy other than conformity with the design concept and general adequacy of the AS-BUILT information to the best of the Architect's/Engineer's knowledge."

Upon completion, The Consultant shall deliver the RECORD-SET original reproducible drawings to DPMC who will acknowledge their receipt in writing. This hard copy set of drawings and two (2) sets of current release AUTO CAD discs shall be submitted to DPMC. The discs shall contain all AS-BUILT drawings in both ".dwg" (native file format for AUTO CAD) and ".pdf" (*Adobe* portable document format) file formats.

J. CONSTRUCTION DEFICIENCY LIST

The Consultant shall prepare, maintain and continuously distribute an on-going deficiency list to the Contractor, Project Manager, and Client Agency Representative during the construction phase of the project. This list shall be separate correspondence from the field observation reports and shall not be considered as a punch list.

K. INSPECTIONS: SUBSTANTIAL & FINAL COMPLETION

The Consultant and their Sub-Consultant(s) accompanied by the Project Manager, Code Inspection Group, Client Agency Representative and Contractor shall conduct site inspections to determine the dates of substantial and final completion. The Project Manager will issue the only recognized official notice of substantial completion. The Consultant shall prepare and distribute the coordinated punch list, written warranties and other related DPMC forms and documents, supplied by the Contractor, to the Project Manager for review and certification of final contract acceptance.

If applicable, the punch list shall include a list of attic stock and spare parts.

L. CLOSE-OUT DOCUMENTS

The Consultant shall review all project close-out documents as submitted by the Contractors to ensure that they comply with the requirements listed in the "Procedure for Architects and Engineers' Manual." The Consultant shall forward the package to the Project Manager within fourteen (14) calendar days from the date the Certificate of Occupancy/Certificate of Approval is issued. The Consultant shall also submit a letter certifying that the project was completed in accordance with the contract documents, etc.

M. CLOSE-OUT ACTIVITY TIME

The Consultant shall provide all activities and deliverables associated with the "Close-Out Phase" of this project as part of their Lump Sum base bid. The Consultant and/or Sub-Consultant(s) may not use this time for additional job meetings or extended administrative services during the Construction Phase of the project.

N. TESTING, TRAINING, MANUALS AND ATTIC STOCK

The Consultant shall ensure that all equipment testing, training sessions and equipment manuals required for this project comply with the requirements identified below.

1. Testing:

All equipment and product testing conducted during the course of construction is the responsibility of the Contractor. However, the Consultant shall ensure the testing procedures comply with manufacturers recommendations. The Consultant shall review the final test reports and provide a written recommendation of the acceptance/rejection of the material, products or equipment tested within seven (7) calendar days of receipt of the report.

2. Training:

The Consultant shall include in the specification that the Contractor shall schedule and coordinate all equipment training with the Project Manager and Client Agency representatives. It shall state that the Contractor shall submit the Operation and Maintenance (O&M) manuals, training plan contents, and training durations to the Consultant, Project Manager and Client Agency Representative for review and approval prior to the training session.

The Consultant shall ensure that the training session is "videotaped" by the Contractor. A copy of the "videotape" shall be transmitted to the Project Manager who will forward the material to the Client Agency for future reference.

All costs associated with the training sessions shall be borne by the Contractor installing the equipment. A signed letter shall be prepared stating when the training was completed and must be accompanied with the training session sign-in sheet as part of the project close-out package.

3. Operation & Maintenance Manuals:

The Consultant shall coordinate and review the preparation and issuance of the equipment manuals provided by the Contractor(s) ensuring that they contain the operating procedures, maintenance procedures and frequency, cut sheets, parts lists, warranties, guarantees, and detailed drawings for all equipment installed at the facility.

A troubleshooting guide shall be included that lists problems that may arise, possible causes with solutions, and criteria for deciding when equipment shall be repaired and when it must be replaced.

Include a list of the manufacturer's recommended spare parts for all equipment being supplied for this project.

A list of names, addresses and telephone numbers of the Contractors involved in the installations and firms capable of performing services for each mechanical item shall be included. The content of the manuals shall be reviewed and approved by the Project Manager and Client Agency Representative.

The Consultant shall include in the specification that the Contractor must provide a minimum of ten (10) "throwaway" copies of the manual for use at the training seminar and seven (7) hardbound copies as part of the project close-out package.

4. Attic Stock:

The Consultant shall determine and recommend whether "attic stock" should be included for all aspects of the project. If required, the Consultant shall specify attic stock items to be included in the project.

Prior to project close-out, the Consultant must prepare a comprehensive listing of all items for delivery by the Contractor to the Owner and in accordance with the appropriate specification/plan section. Items shall include, but not be limited to: training sessions, O&M manuals, as-built drawings, itemized attic stock requirements, and manufacturer guarantees/warranties.

O. CHANGE ORDERS

The Consultant shall review and process all change orders in accordance with the contract documents and procedures described below.

1. Consultant:

The Consultant shall prepare a detailed request for Change Order including a detailed description of the change(s) along with appropriate drawings, specifications, and related documentation and submit the information to the Contractor for the change order request submission. This will require the use of the current DPMC 9b form.

2. Contractor:

The Contractor shall submit a DPMC 9b Change Order Request form to the Project Manager within seven (7) calendar days after receiving the Change Order from the Consultant. The document shall identify the changed work in a manner that will allow a clear understanding of the necessity for the change. Copies of the original design drawings, sketches, etc. and specification pages shall be highlighted to clarify and show entitlement to the Change Order.

Copies shall be provided of job minutes or correspondence with all relative information highlighted to show the origin of the Change Order. Supplementary drawings from the Consultant shall be included if applicable that indicate the manner to be used to complete the changed work. A detailed breakdown of all costs associated with the change, i.e. material, labor, equipment, overhead, Sub-Contractor work, profit and bond, and certification of increased bond shall be provided.

If the Change Order will impact the time of the project, the Contractor shall include a request for an extension of time. This request shall include a copy of the original approved project schedule and a proposed revised schedule that reflects the impact on the project completion date. Documentation to account for the added time requested shall be included to support entitlement of the request such as additional work, weather, other Contractors, etc. This documentation shall contain dates, weather data and all other relative information.

3. Recommendation for Approval:

The Consultant shall evaluate the reason for the change in work and provide a detailed written recommendation for approval or disapproval of the Change Order Request including backup documentation of costs in CSI format and all other considerations to substantiate that decision.

4. Code Review:

The Consultant shall determine if the Change Order request will require Code review and shall submit six (6) sets of signed and sealed modified drawings and specifications to the DPMC Plan & Code Review Unit for approval, if required. The Consultant must also determine and produce a permit amendment request if required.

5. Cost Estimate:

The Consultant shall provide a detailed cost estimate of the proposed Change Order Request, as submitted by the Contractor, in CSI format (latest edition) for all appropriate divisions and sub-divisions using a recognized estimating formula. The estimate shall then be compared with that of the Contractor's estimate. If any line item in the Consultant's estimate is lower than the corresponding line item in the Contractor's estimate, the Consultant in conjunction with the Project Manager is to contact the Contractor by telephone and negotiate the cost differences. The Consultant shall document the negotiated agreement on the Change Order Request form. If the Contractor's total dollar value changes based on the negotiations, the Consultant shall identify the changes on the Change Order Request form accordingly.

When recommending approval or disapproval of the change order, the Consultant shall be required to prepare and process a Change Order package that contains at a minimum the following documents:

- DPMC 9b Change Order Request
- DPMC 10 Consultant's Evaluation of Contractor's Change Order Request
- Consultant's Independent Detailed Cost Estimate
- Notes of Negotiations

6. Time Extension:

When a Change Order Request is submitted with both cost and time factors, the Consultant's independent cost estimate is to take into consideration time factors associated with the changed work. The Consultant is to compare their time element with that of the Contractor's time request and if there is a significant difference, the Consultant in conjunction with the Project Manager is to contact the Contractor by telephone and negotiate the difference.

When a Change Order Request is submitted for time only, the Consultant is to do an independent evaluation of the time extension request using a recognized scheduling formula.

Requests for extension of contract time must be done in accordance with the General Conditions Article 10.1 "Changes in the Work".

7. Submission:

The Consultant shall complete all of the DPMC Change Order Request forms provided and submit a completed package to the Project Manager with all appropriate backup documentation within seven (7) calendar days from receipt of the Contractor's change order request. The Consultant shall resubmit the package at no cost to the State if the change order package contents are deemed insufficient by the Project Manager.

8. Meetings:

The Consultant shall attend and actively participate at all administrative hearings or settlement conferences as may be called by Project Manager in connection with such Change Orders and provide minutes of those meetings to the Project Manager for distribution.

9. Consultant Fee:

All costs associated with the potential Contractor Change Order Requests shall be anticipated by the Consultant and included in the base bid of their fee proposal.

If the Client Agency Representative requests a scope change; and it is approved by the Project Manager, the Consultant may be entitled to be reimbursed through an amendment and in accordance with the requirements stated in paragraph 10.01 of this Scope of Work.

IX. PERMITS & APPROVALS

A. NJ UNIFORM CONSTRUCTION CODE PERMIT

The project construction documents must comply with the latest adopted edition of the NJ Uniform Construction Code (NJUCC).

The latest NJUCC Adopted Codes and Standards can be found at:

http://www.state.nj.us/dca/divisions/codes/codreg/

The Consultant shall complete the NJUCC permit application and all applicable technical sub-code sections with all technical site data required. The Agent section of the application and certification section of the building sub-code section shall be signed. These documents shall be forwarded to the DPMC Project Manager who will send them to the Department of Community Affairs (DCA) and all permit application costs will be paid by DPMC.

The Consultant may obtain copies of all NJUCC permit applications at the following website:

http://www.state.nj.us/dca/divisions/codes/forms/

All other required project permits shall be obtained and paid for by the Consultant in accordance with the procedures described in Paragraph IX.B.

1. Prior Approval Certification Letters:

The issuance of a construction permit for this project may be contingent upon acquiring various "prior approvals" as defined by N.J.A.C. 5:23-1.4. It is the Consultant's responsibility to determine which prior approvals, if any, are required. The Consultant shall submit a general certification letter to the DPMC Plan & Code Review Unit Manager during the Permit Phase of this project that certifies all required prior approvals have been obtained.

In addition to the general certification letter discussed above, the following specific prior approval certification letters, where applicable, shall be submitted by the Consultant to the DPMC Plan & Code Review Unit Manager: Soil Erosion & Sediment Control, Water & Sewer Treatment Works Approval, Coastal Areas Facilities Review, Compliance of Underground Storage Tank Systems with N.J.A.C. 7:14B, Pinelands Commission, Highlands Council, Well Construction and Maintenance; Sealing of Abandoned Wells with N.J.A.C. 7:9D, Certification that all utilities have been disconnected from structures to be demolished, Board of Health Approval for Potable Water Wells, Health Department Approval for Septic Systems. It shall be noted that in accordance with N.J.A.C. 5:23-2.15(a)5, a permit cannot be issued until the letter(s) of certification is received.

2. Multi-building or Multi-site Permits:

A project that involves many buildings and/or sites requires that a separate permit shall be issued for each building or site. The Consultant must determine the construction cost estimate for *each* building and/or site location and submit that amount where indicated on the permit application.

3. Special Inspections:

In accordance with the requirements of the New Jersey Uniform Construction Code N.J.A.C. 5:23-2.20(b), Bulletin 03-5 and Chapter 17 of the International Building Code, the Consultant shall be responsible for the coordination of all special inspections during the construction phase of the project.

Bulletin 03-5 can be found at:

http://www.state.nj.us/dca/divisions/codes/publications/pdf_bulletins/b_03_5.pdf

a. Definition:

Special inspections are defined as an independent verification by a certified Special Inspector for **Class I buildings and smoke control systems in any class building**. The special inspector is to be independent from the Contractor and responsible to the Consultant so that there is no possible conflict of interest.

Special inspectors shall be certified in accordance with the requirements in the New Jersey Uniform Construction Code.

b. Responsibilities:

The Consultant shall submit with the permit application, a list of special inspections and the agencies or special inspectors that will be responsible to carry out the inspections required for the project. The list shall be a separate document, on letter head, signed and sealed.

B. OTHER REGULATORY AGENCY PERMITS, CERTIFICATES AND APPROVALS

The Consultant shall identify and obtain all other State Regulatory Agency permits, certificates, and approvals that will govern and affect the work described in this Scope of Work. An itemized list of these permits, certificates, and approvals shall be included with the Consultant's Technical Proposal and the total amount of the application fees should be entered in the Fee Proposal line item entitled, **"Permit Fee Allowance."**

The Consultant may refer to the Division of Property Management and Construction "Procedures for Architects and Engineers Manual", Section 6.4.8, which presents a compendium of State permits, certificates, and approvals that may be required for this project.

The Consultant shall determine the appropriate phase of the project to submit the permit application(s) in order to meet the approved project milestone dates.

Where reference to an established industry standard is made, it shall be understood to mean the most recent edition of the standard unless otherwise noted. If an industry standard is found to be revoked, or should the standard have undergone substantial change or revision from the time that the Scope of Work was developed, the Consultant shall comply with the most recent edition of the standard.

C. STATE INSURANCE APPROVAL

The Consultant shall respond in writing to the FM Global Insurance Underwriter plan review comments through the DPMC Plan & Code Review Unit Manager as applicable. The Consultant shall review all the comments and, with agreement of the Project Team, modify the documents while adhering to the project's SOW requirements, State code requirements, schedule, budget, and Consultant fee.

D. PUBLIC EMPLOYEES OCCUPATIONAL SAFETY & HEALTH PROGRAM

A paragraph shall be included in the design documents, if applicable to this project that states: The Contractor shall comply with all the requirements stipulated in the Public Employees Occupational Safety & Health Program (PEOSHA) document, paragraph 12:100-13.5 entitled "Air quality during renovation and remodeling". The Contractor shall submit a plan demonstrating the measures to be utilized to confine the dust, debris, and air contaminants in the renovation or construction area of the project site to the Project Team prior to the start of construction.

The link to the document is: http://www.state.nj.us/health/eoh/peoshweb/iaqstd.pdf

E. PERMIT MEETINGS

The Consultant shall attend and chair all meetings with Permitting Agencies necessary to explain and obtain the required permits.

F. MANDATORY NOTIFICATIONS

The Consultant shall include language in Division 1 of the specification that states the Contractor shall assure compliance with the New Jersey "One Call" Program (1-800-272-1000) if any excavation is to occur at the project site.

The One Call Program is known as the "New Jersey Underground Facility Protection Act", refer to N.J.A.C. 14:2.

G. CONSULTANT FEE

The Consultant shall determine the efforts required to complete and submit all permit applications, obtain and prepare supporting documentation, attend meetings, etc., and include the total cost in the base bid of their fee proposal under the "Permit Phase".

X. GENERAL REQUIREMENTS

A. SCOPE CHANGES

The Consultant must request any changes to this Scope of Work in writing. An approved DPMC 9d Consultant Amendment Request form reflecting authorized scope changes must be received by the Consultant prior to undertaking any additional work. The DPMC 9d form must be approved and signed by the Director of DPMC and written authorization issued from the Project Manager prior to any work being performed by the Consultant. Any work performed without the executed DPMC 9d form is done at the Consultant's own financial risk.

B. ERRORS AND OMISSIONS

The errors and omissions curve and the corresponding sections of the "Procedures for Architects and Engineers Manual" are eliminated. All claims for errors and omissions will be pursued by the State on an individual basis. The State will review each error or omission with the Consultant and determine the actual amount of damages, if any, resulting from each negligent act, error or omission.

C. ENERGY INCENTIVE PROGRAM

The Consultant shall review the programs described on the "New Jersey's Clean Energy Program" website at: http://www.njcleanenergy.com to determine if any proposed upgrades to the mechanical and/or electrical equipment and systems for this project qualify for "New Jersey Clean Energy Program" rebates and incentives such as SmartStart, Pay4Performance, Direct Install or any other incentives.

The Consultant shall be responsible to complete the appropriate registration forms and applications, provide any applicable worksheets, manufacturer's specification sheets, calculations, attend meetings, and participate in all activities with designated representatives of the programs and utility companies to obtain the entitled financial incentives and rebates for this project. All costs associated with this work shall be estimated by the Consultant and the amount included in the base bid of their fee proposal.

XI. ALLOWANCES

A. PERMIT FEE ALLOWANCE

The Consultant shall obtain and pay for all of the project permits in accordance with the guidelines identified below.

1. Permits:

The Consultant shall determine the various permits, certificates, and approvals required to complete this project.

2. Permit Costs:

The Consultant shall estimate the application fee costs for all of the required project permits, certificates, and approvals (excluding the NJ Uniform Construction Code permit) and include that amount in their fee proposal line item entitled **"Permit Fee Allowance"**, refer to Paragraph IX.A. A breakdown of each permit and application fee shall be attached to the fee proposal for reference.

NOTE: The NJ Uniform Construction Code permit is excluded since it is obtained and paid for by DPMC.

3. Applications:

The Consultant shall complete and submit all permit applications to the appropriate permitting authorities and the costs shall be paid from the Consultant's permit fee allowance. A copy of the application(s) and the original permit(s) obtained by the Consultant shall be given to the DPMC Project Manager for distribution during construction.

4. Consultant Fee:

The Consultant shall determine what is required to complete and submit the permit applications, obtain supporting documentation, attend meetings, etc., and include the total cost in the base bid of their fee proposal under the "Permit Phase" column.

Any funds remaining in the permit allowance will be returned to the State at the close of the project.

XII.SUBMITTAL REQUIREMENTS

A. CONTRACT DELIVERABLES

All submissions shall include the Contract Deliverables identified in Section XIV of this Scope of Work and described in the DPMC Procedures for Architects and Engineers Manual.

B. CATALOG CUTS

The Consultant shall provide catalog cuts as required by the DPMC Plan & Code Review Unit during the design document review submissions. Examples of catalog cuts include, but are not limited to: mechanical equipment, hardware devices, plumbing fixtures, fire suppression and alarm components, specialized building materials, electrical devices, etc.

C. PROJECT DOCUMENT BOOKLET

The Consultant shall submit all of the required Contract Deliverables to the Project Manager at the completion of each phase of the project. All reports, meeting minutes, plan review comments, project schedule, cost estimate in CSI format (2004 Edition), correspondence, calculations, and other appropriate items identified on the Submission Checklist form provided in the A/E Manual shall be presented in an 8½" x 11" bound "booklet" format.

D. DESIGN DOCUMENT CHANGES

Any corrections, additions, or omissions made to the submitted drawings and specifications at the Permit Phase of the project must be submitted to DPMC Plan & Code Review Unit as a complete document. Corrected pages or drawings may not be submitted separately unless the Consultant inserts the changed page or drawing in the original documents. No Addendums or Bulletins will be accepted as a substitution to the original specification page or drawing.

E. SINGLE-PRIME CONTRACT

All references to "separate contracts" in the Procedures for Architects and Engineers Manual, Chapter 8, shall be deleted since this project will be advertised as a "Single Bid" (Lump Sum All Trades) contract. The single prime Contractor will be responsible for all work identified in the drawings and specifications.

The drawings shall have the required prefix designations and the specification sections shall have the color codes as specified for each trade in the DPMC Procedure for Architects and Engineers Manual.

The Consultant must still develop the Construction Cost Estimate (CCE) for each trade and the amount shall be included on the DPMC-38 Project Cost Analysis form where indicated. This

document shall be submitted at each design phase of the project and updated immediately prior to the advertisement to bid.

XIII. SOW SIGNATURE APPROVAL SHEET

This Scope of Work shall not be considered a valid document unless all signatures appear in each designated area below.

The Client Agency approval signature on this page indicates that they have reviewed the design criteria and construction schedule described in this project Scope of Work and verifies that the work will not conflict with the existing or future construction activities of other projects at the site.

SOW PREPARED BY: _____ 3/6/17
JAMES J. MCKENNA, MANAGER — DATE
DPMC PROJECT PLANNING & INITIATION

SOW APPROVED BY: _____ 3/6/17
MICHAEL CHIANESE, MANAGER — DATE
OFFICE OF INFORMATION TECHNOLOGY

SOW APPROVED BY: _____ 3/6/17
RICHARD HERRERO, PROJECT MANAGER — DATE
DPMC PROJECT MANAGEMENT GROUP

SOW APPROVED BY: _____ 3/7/17
RICHARD FLODMAND, DEPUTY DIRECTOR — DATE
DIV PROPERTY MGT & CONSTRUCTION

XIV.CONTRACT DELIVERABLES

The following is a listing of Contract Deliverables that are required at the completion of each phase of this project. The Consultant shall refer to the DPMC publication entitled, "Procedures for Architects and Engineers," Volumes I and II, 2nd Edition, dated January, 1991 to obtain a more detailed description of the deliverables required for each item listed below.

The numbering system used in this "Contract Deliverables" section of the scope of work corresponds to the numbering system used in the "Procedures for Architects and Engineers" manual and some may have been deleted if they do not apply to this project.

SCHEMATIC DESIGN PHASE:

6.1 Project Schedule (Update Bar Chart Schedule)

6.2 Meetings & Minutes (Minutes within seven (7) calendar days of meeting)

6.3 Correspondence

6.4 Submission Requirements

6.4.1 A/E Statement of Site Visit, As-Built Drawing Verification (if available)
6.4.2 Space Analysis & Program Requirements
6.4.3 Special Features Description: communications, security, fire protection, special structural features, etc.
6.4.4 Site Evaluation
6.4.7 Design Rendering/Sketches
6.4.8 Regulatory Agency Approvals
6.4.8.2 NJ Department of Community Affairs
(a) UCC Permit for Building Construction
6.4.9 Utility Availability for:
Electric Service
6.4.10 Drawings: 6 sets
Cover Sheet (See A/E Manual for format)
Site Plan
Site Utility Plan
Floor Plans
Elevations
Sections/Details
Electrical Narrative
6.4.11 Specifications: 6 sets (See A/E Manual for format, include Division 1 and edit to describe the administrative and general requirements of the project)

6.4.12 Current Working Estimate in CSI Format & Cost Analysis 38 Form
6.4.13 Bar Chart of Design and Construction Schedule
6.4.14 Oral Presentation of Submission to Project Team
6.4.15 SOW Compliance Statement
6.4.16 This Submission Checklist (See A/E Manual, Figure 6.4.16 for format)
6.4.17 Deliverables Submission in Booklet Form: 7 sets

6.5 Approval

6.5.1 Respond to Submission Comments

6.6 Submission Forms

Figure 6.4.10 Plan Review Record Sheet
Figure 6.4.12 Current Working Estimate/Cost Analysis
Figure 6.4.16 Submission Checklist

DESIGN DEVELOPMENT PHASE:

7.1 Project Schedule (Update Bar Chart Schedule)

7.2 Meetings & Minutes (Minutes within seven (7) calendar days of meeting)

7.3 Correspondence

7.4 Submission Requirements

7.4.1 A/E Statement of Site Visit, As-Built Drawing Verification (if available)
7.4.2 Space Analysis & Program Requirements (if changed from Schematic Phase)
7.4.3 Special Features Description: communications, security, fire protection, special structural features, etc.
7.4.4 Site Evaluation
7.4.7 Design Rendering/Sketches
7.4.8 Regulatory Agency Approvals (See Section 6.4.8 for listing)
7.4.9 Confirm Utility Availability (On Site & Public)
Electric Service
7.4.10 Drawings: 6 sets
Cover Sheet (See A/E Manual for format)
Site Plan
Site Utility Plan
Floor Plans
Elevations
Sections/Details
Structural Drawings, Seismic Design Load Criteria

Electrical Drawings, Riser Diagram, Panel Schedules, Service Size, Lighting Design
7.4.11 Specifications: 6 sets (See A/E Manual for format, include Division 1 and edit to describe the administrative and general requirements of the project)
7.4.12 Current Working Estimate in CSI Format & Cost Analysis 38 Form
7.4.13 Bar Chart of Design and Construction Schedule
7.4.14 Oral Presentation of Submission to Project Team
7.4.15 SOW Compliance Statement
7.4.16 This Submission Checklist (See A/E Manual, Figure 6.4.16 for format)
7.4.17 Deliverables Submission in Booklet Form: 7 sets

7.5 Approval

7.5.1 Respond to Submission Comments

7.6 Submission Forms

Figure 7.4.12 Current Working Estimate/Cost Analysis
Figure 7.4.16 Submission Checklist

FINAL DESIGN PHASE:

This Final Design Phase may require more than one submission based on the technical quality and code conformance of the design documents.

8.1 Schedule (Update Bar Chart Schedule)

8.2 Meeting & Minutes (Minutes within seven (7) calendar days of meeting)

8.3 Correspondence

8.4 Submission Requirements

8.4.1 A/E Statement of Site Visit
8.4.2 Space Analysis
8.4.3 Special Features Description, Communication/Security/Fire/Smoke/Exhaust)
8.4.4 Site Evaluation
8.4.8 Regulatory Agency Approvals (Include itemized list specific to this project)
8.4.10 Drawings: 6 sets
8.4.11 Specifications: 6 sets
8.4.12 Current Working Estimate in CSI Format & Cost Analysis 38 Form
8.4.13 Bar Chart of Design and Construction Schedule
8.4.14 Oral Presentation of this Submission to Project Team

8.4.15 Plan Review/SOW Compliance Statement
8.4.16 This Submission Checklist
8.4.17 Deliverables Submission in Booklet Form: 7 sets

8.5 Approvals

8.5.1 Respond to Submission Comments

PERMIT APPLICATION PHASE:

This Permit Application Phase should not include any additional design issues. Design documents shall be 100% complete at the Final Design Phase.

8.6 Permit Application Submission Requirements

8.6.1 - 8.6.7: If all of the deliverables of these sections have been previously submitted to DPMC and approved there are no further deliverables due at this time
8.6.8 Regulatory Agency Approvals
(a) UCC Permit Application & Technical Sub-codes completed by A/E
8.6.9 Utility Availability Confirmation
8.6.10 Signed and Sealed Drawings: 6 sets
8.6.11 Signed and Sealed Specifications: 6 sets
8.6.12 Current Working Estimate/Cost Analysis
8.6.13 Bar Chart Schedule
8.6.14 Project Presentation (N/A this Project)
8.6.15 Plan Review/SOW Compliance Statement
8/6.16 Submission Checklist

8.7 Approvals

8.8 Submission Forms

Figure 8.4.12 Current Working Estimate/Cost Analysis
Figure 8.4.16 Submission Checklist (Final Review Phase)
Figure 8.6.12-b Bid Proposal Form (Form DPMC -3)
Figure 8.6.12-c Notice of Advertising (Form DPMC -31)
Figure 8.6.16 Submission Checklist (Permit Phase)
Figure 8.7 Bid Clearance Form (Form DPMC -601)

BIDDING AND CONTRACT AWARD:

9.0 Bidding Phase Requirements

9.01 Original Drawings signed & sealed by A/E and drawings on compact disk (CD) in *Adobe Portable Document Format (*.pdf)
9.02 One Unbound Specification Color Coded per A/E Manual Section 8.4.11 and specifications on compact disk (CD) in *Adobe Portable Document Format (*.pdf)
` 9.03 Bid Documents Checklist
9.04 Bid Proposal Form
9.05 Notice for Advertising

9.1 Chair Pre-Bid Conference/Mandatory Site Visit

9.2 Prepare Bulletins

9.3 Attend Bid Opening

9.4 Recommendation for Contract Award

9.4.1 Prepare Letter of Recommendation for Award & Cost Analysis

9.5 Attend Pre-Construction Meeting

9.6 Submission Checklist

9.7 Submission Forms

Figure 9.4.1 Cost Analysis
Figure 9.6 Submission Checklist

CONSTRUCTION PHASE:

10.1 Site Construction Administration

10.2 Pre-Construction Meeting

10.3 Construction Job Meetings

10.3.1 Agenda: Schedule and Chair Construction Job Meetings
10.3.2 Minutes: Prepare and Distribute Minutes within 5 working days of meeting
10.3.3 Schedules; Approve Contractors' Schedule & Update
10.3.4 Minutes Format: Prepare Job Meeting Minutes in approved format, figure 10.3.4-a

10.4 Correspondence

10.5 Prepare and Deliver Conformed Drawings

10.7 Approve Contractors Invoicing and Payment Process

10.8 Approve Contractors 12/13 Form for Subs, Samples and Materials

10.10 Approve Test Reports

10.11 Approve Shop Drawings

10.12 Construction Progress Schedule

10.12.1 Construction Progress Schedule
10.12.2 CPM Consultant

10.13 Review & Recommend or Reject Change Orders

10.13.1 Scope Changes
10.13.2 Construction Change Orders
10.13.3 Field Changes

10.14 Construction Photographs

10.15 Submit Field Observation Reports

10.16 Submission Forms

Figure 10.3.4-a Job Meeting Format of Minutes
Figure 10.3.4-b Field Report
Figure 10.6 DPMC Insurance Form-24
Figure 10.6-a Unit Schedule Breakdown
Figure 10.6-b Monthly Estimate for Payment to Contractor DPMC 11-2
Figure 10.6-c Monthly Estimate for Payment to Contractor DPMC 11-2A
Figure 10.6-d Invoice DPMC 11
Figure 10.6-e Prime Contractor Summary of Stored Materials DPMC 11-3
Figure 10.6-f Agreement & Bill of Sale certificate for Stored Materials DPMC 3A
Figure 10.7-a Approval Form for Subs, Samples & Materials DPMC 12
Figure 10.7-b Request for Change Order DPMC 9b
Figure 10.9 Transmittal Form DPMC 13
Figure 10.10 Submission Checklist

PROJECT CLOSE-OUT PHASE:

11.1 Responsibilities: Plan, Schedule and Execute Close-Out Activities

11.2 Commencement: Initiate Close-Out w/DPMC 20A Project Close-Out Form

11.3 Develop Punch List & Inspection Reports

11.4 Verify Correction of Punch List Items

11.5 Determination of Substantial Completion

11.6 Ensure Issuance of "Temporary Certificate of Occupancy or Approval"

11.7 Initiation of Final Contract Acceptance Process

11.8 Submission of Close-Out Documentation

11.8.1 As-Built & Record Set Drawings, 3 sets AUTOCAD Discs Delivered to DPMC
11.8.2 (a) Maintenance and Operating manuals, Warranties, etc.: 7 sets each
(b) Guarantees
(c) Testing and Balancing Reports
(d) Boiler Inspection Certificates
(e) Elevator Inspection Report
(f) Shop Drawings
(g) Letter of Contract Performance
11.8.3 Final Cost Analysis-Insurance Transfer DPMC 25
11.8.4 This Submission Checklist

11.9 Final Payment

11.9.1 Contractors Final Payment
11.9.2 A/E Invoice and Close-Out Forms for Final Payment

11.10 Final Performance Evaluation of the A/E and the Contractors

11.11 Ensure Issuance of a "Certificate of Occupancy or Approval"

11.12 Submission Forms

Figure 11.2	Project Close-Out Documentation List DPMC 20A
Figure 11.3-a	Certificate of Substantial Completion DPMC 20D
Figure 11.3-b	Final Acceptance of Consultant Contract DPMC 20C
Figure 11.5	Request for Contract Transition Close-Out DPMC 20X
Figure 11.7	Final Contract Acceptance Form DPMC 20

Figure 11.8.3-a Final Cost Analysis
Figure 11.8.3-b Insurance Transfer Form DPMC 25
Figure 11.8.4 Submission Checklist

XV.EXHIBITS

The attached exhibits in this section will include a sample project schedule, and any supporting documentation to assist the Consultant in the design of the project such as maps, drawings, photographs, floor plans, studies, reports, etc.

END OF SCOPE OF WORK

February 7, 1997
Rev.: January 29, 2002

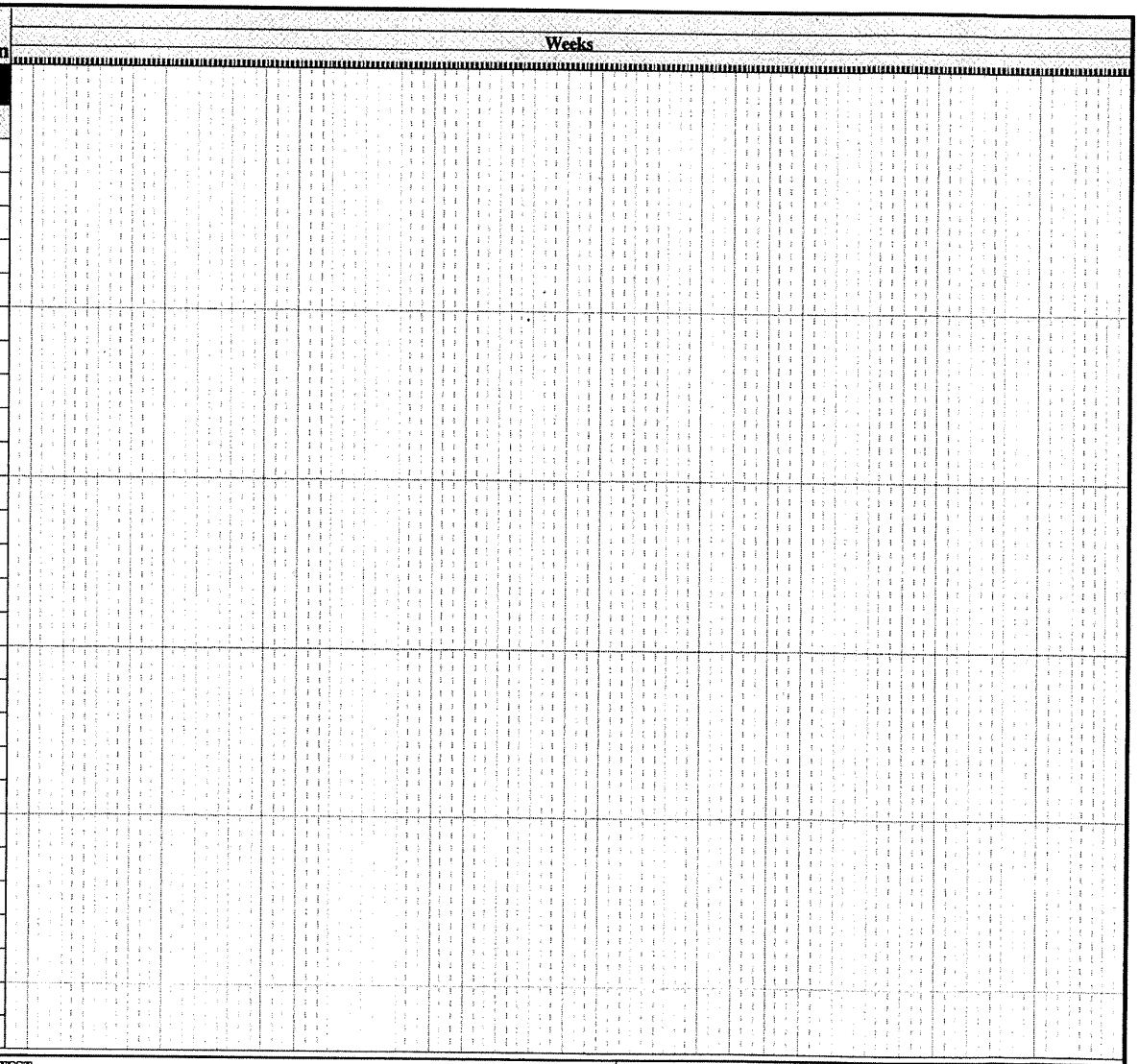
Responsible Group Code Table

The codes below are used in the schedule field "GRP" that identifies the group responsible for the activity. The table consists of groups in the Division of Property Management & Construction (DPMC), as well as groups outside of the DPMC that have responsibility for specific activities on a project that could delay the project if not completed in the time specified. For reporting purposes, the groups within the DPMC have been defined to the supervisory level of management (i.e., third level of management, the level below the Associate Director) to identify the "functional group" responsible for the activity.

CODE	DESCRIPTION	REPORTS TO ASSOCIATE DIRECTOR OF:
CM	Contract Management Group	Contract Management
CA	Client Agency	N/A
CSP	Consultant Selection and Prequalification Group	Technical Services
A/E	Architect/Engineer	N/A
PR	Plan Review Group	Technical Services
CP	Construction Procurement	Planning & Administration
CON	Construction Contractor	N/A
FM	Financial Management Group	Planning & Administration
OEU	Office of Energy and Utility Management	N/A
PD	Project Development Group	Planning & Administration

EXHIBIT 'A'

Activity ID	Description	Rspn
<PROJ>		
Design		
CV3001	Schedule/Conduct Predesign/Project Kick-Off Mtg.	CM
CV3020	Prepare Program Phase Submittal	AE
CV3021	Distribute Program Submittal for Review	CM
CV3027	Prepare & Submit Project Cost Analysis (DPMC-38)	CM
CV3022	Review & Approve Program Submittal	CA
CV3023	Review & Approve Program Submittal	PR
CV3024	Review & Approve Program Submittal	CM
CV3025	Consolidate & Return Program Submittal Comments	CM
CV3030	Prepare Schematic Phase Submittal	AE
CV3031	Distribute Schematic Submittal for Review	CM
CV3037	Prepare & Submit Project Cost Analysis (DPMC-38)	CM
CV3032	Review & Approve Schematic Submittal	CA
CV3033	Review & Approve Schematic Submittal	PR
CV3034	Review & Approve Schematic Submittal	CM
CV3035	Consolidate & Return Schematic Submittal Comment	CM
CV3040	Prepare Design Development Phase Submittal	AE
CV3041	Distribute D. D. Submittal for Review	CM
CV3047	Prepare & Submit Project Cost Analysis (DPMC-38)	CM
CV3042	Review & Approve Design Development Submittal	CA
CV3043	Review & Approve Design Development Submittal	PR
CV3044	Review & Approve Design Development Submittal	CM
CV3045	Consolidate & Return D.D. Submittal Comments	CM
CV3050	Prepare Final Design Phase Submittal	AE
CV3051	Distribute Final Design Submittal for Review	CM
CV3052	Review & Approve Final Design Submittal	CA
CV3053	Review & Approve Final Design Submittal	PR
CV3054	Review Final Design Submitl for Constructability	OCS



NOTE:
Refer to section "IV Project Schedule" of the Scope of Work for contract phase durations.

DBCA - TEST

Sheet 1 of 3

Bureau of Design & Construction Services
Routine Project

Exhibit "A"

Activity ID	Description	Rspn	Weeks
CV3055	Review & Approve Final Design Submittal	CM	
CV3056	Consolidate & Return Final Design Comments	CM	
CV3060	Prepare & Submit Permit Application Documents	AE	
CV3068	Prepare & Submit Bidding Cost Analysis (DPMC-38)	CM	
Plan Review-Permit Acquisition			
CV4001	Review Constr. Documents & Secure UCC Permit	PR	
CV4010	Provide Funding for Construction Contracts	CA	
CV4020	Secure Bid Clearance	CM	
Advertise-Bid-Award			
CV5001	Advertise Project & Bid Construction Contracts	CP	
CV5010	Open Construction Bids	CP	
CV5011	Evaluate Bids & Prep. Recommendation for Award	CM	
CV5012	Evaluate Bids & Prep. Recommendation for Award	AE	
CV5014	Complete Recommendation for Award	CP	
CV5020	Award Construction Contracts/Issue NTP	CP	
Construction			
CV6000	Project Construction Start/Issue NTP	CM	
CV6001	Contract Start/Contract Work (25%) Complete	CON	
CV6002	Preconstruction Meeting	CM	
CV6003	Begin Preconstruction Submittals	CON	
CV6004	Longest Lead Procurement Item Ordered	CON	
CV6005	Lead Time for Longest Lead Procurement Item	CON	
CV6006	Prepare & Submit Shop Drawings	CON	
CV6007	Complete Construction Submittals	CON	
CV6011	Roughing Work Start	CON	
CV6012	Perform Roughing Work	CON	
CV6010	Contract Work (50%+) Complete	CON	
CV6013	Longest Lead Procurement Item Delivered	CON	
CV6020	Contract Work (75%) Complete	CON	

NOTE:
Refer to section "IV Project Schedule" of the Scope of Work for contract phase durations.

DBCA - TEST

Sheet 2 of 3

Bureau of Design & Construction Services
Routine Project

Exhibit "A"

Activity ID	Description	Rspn	Weeks
CV6014	Roughing Work Complete	CON	
CV6021	Interior Finishes Start	CON	
CV6022	Install Interior Finishes	CON	
CV6030	Contract Work to Substantial Completion	CON	
CV6031	Substantial Completion Declared	CM	
CV6075	Complete Deferred Punch List/Seasonal Activities	CON	
CV6079	Project Construction Complete	CM	
CV6080	Close Out Construction Contracts	CM	
CV6089	Construction Contracts Complete	CM	
CV6090	Close Out A/E Contract	CM	
CV6092	Project Completion Declared	CM	

NOTE:
Refer to section "IV Project Schedule" of the Scope of Work for contract phase durations.

DBCA - TEST

Sheet 3 of 3

Bureau of Design & Construction Services
Routine Project

Exhibit "A"

Location Plan
DPMC Project No. A1236-00

Data Center Power Distribution System Improvements

NJ State Police Technology Complex
1200 Negron Drive
Hamilton Township, Mercer County, N.J. 08691

GPS Coordinates: 40.201321, -74.642586

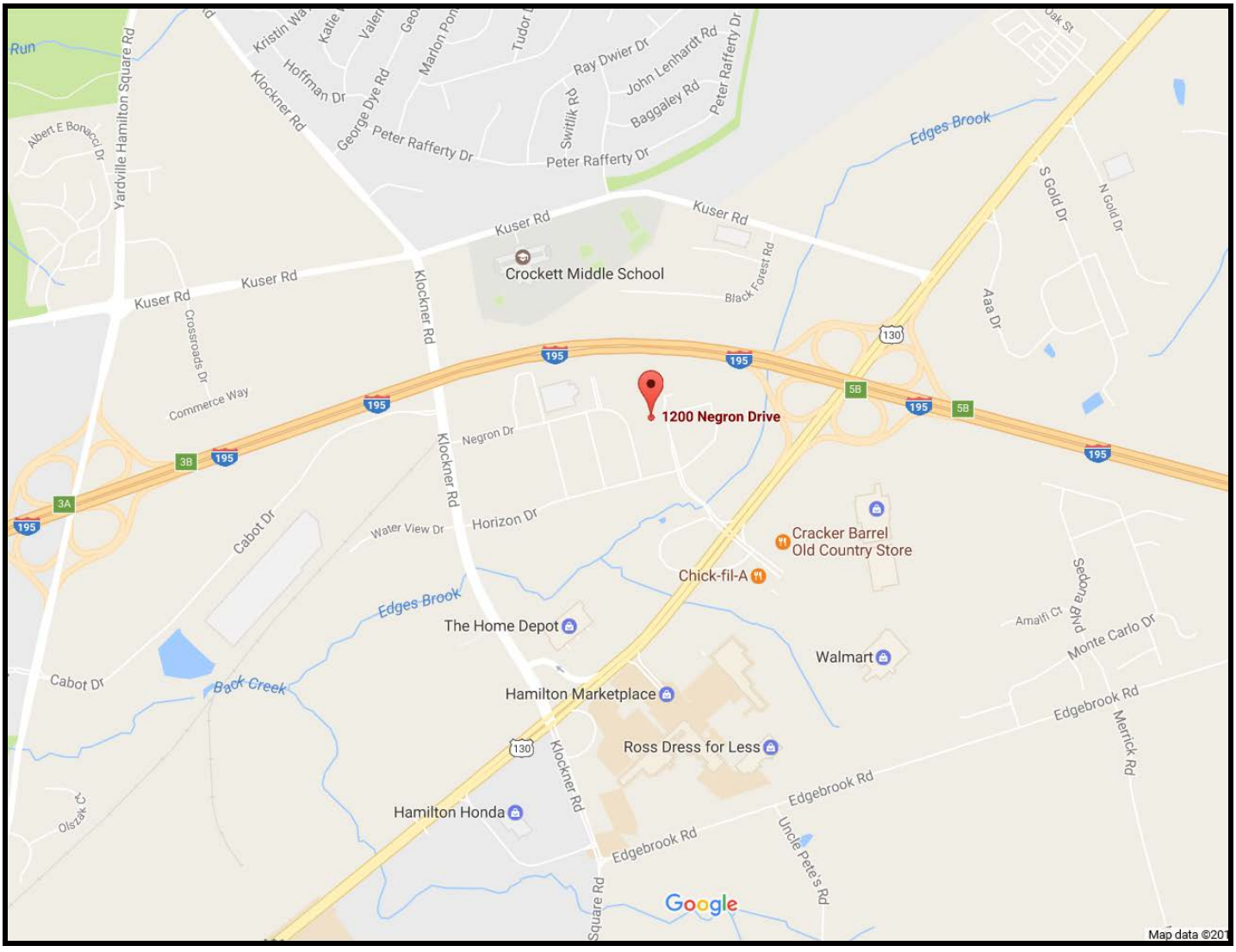


EXHIBIT 'B'

REPORT

ELECTRICAL POWER DISTRIBUTION OPTIMIZATION

For:

NJ OFFICE of INFORMATION TECHNOLOGY
Hamilton Data Center

1200 Negron Drive
Hamilton, New Jersey

Prepared By:

EI ASSOCIATES

Architects & Engineers, PA

8 Ridgedale Avenue
Cedar Knolls, NJ 07927

14 September 2015

EIA Project No. EG7768.00

EXHIBIT 'C'

TABLE OF CONTENTS **PAGE**

B. COST ESTIMATE WORK SHEETS

IMPROVED RELIABILITY ESTIMATE

•

EXECUTIVE SUMMARY

Recommendations for improved reliability have been developed. This includes a new UPS system to be connected to switchboard #4 and reconnection of some CRAC units and cooling water circulation pumps to switchboard #2. The cost for this work is *$1,207,995*. This cost does not include escalation. Recommendations for future increase in data center load have been developed and are included in attached one line diagrams and layout drawings.

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I. BACKGROUND

EI Associates has been engaged by the New Jersey Department of Information Technology (NJOIT) to prepare this report to study methods for improving the reliability of the datacenter power distribution system and investigating way of increasing data center future capacity. The following is a report of our findings:

II. PROJECT DESCRIPTION

The building is powered by outdoor 13.2 kV switchgear which power several pad mounted liquid filled transformer which provide 277/480 volt power. The data center is powered two transformers and their respective switch boards as follows:

Switchboard #2

Switchboard #2 is fed by a 2000 kVA, 277/480 transformer. The switchboard is rated 2000 amps and has a 2000 amp main fused disconnect. Other areas in the building are also powered by this switchboard. Individual loads on this switchboard are connected to a 1000 kW standby generator via multiple ATS's.

Switchboard #4

Switchboard #4 is fed by a 1500 kVA, 277/480 transformer. The switchboard is rated 2000 amps and has a 2000 amp main circuit breaker. ATS-5 connects this switchboard to a 1500 kW standby generator.

Data Center power

The data center is powered by a 500 kW UPS system which is supplied by an 800 amp circuit breaker in switchboard #2. The connection is through ATS-4 which selects between the normal source and a 1000 kW standby generator. The UPS has provisions for a future second module.

The output of the UPS is at 480 volts. This is stepped down to 120/208 volts by a single 500 kVA transformer located in the UPS room. This transformer feeds two 800 amp, 120/208 volt Power Distribution Units (PDU's) A and B. PDU A is located in the UPS room and PDU B is located in the adjacent loading dock. The PDU's feed distribution panels on the data center floor.

One of the two data center chillers is connected to Switchboard #2. The other chiller is connected to Switchboard #4. Data center CRAC units are connected to Switchboard #4.

III. DISCUSSION

The data center power distribution system, as it is presently configured, has many single points of failure. One purpose of this study is to provide design recommendations on reducing single points of electrical failure throughout the existing electrical system.

The single points of failure are as follows:

- Transformer serving switchboard #2
- The feeder connecting the transformer to the switchboard
- Switchboard #2
- The circuit breaker and feeder to ATS-4
- ATS-4
- The feeder to the UPS distribution panel
- UPS distribution panel SWBD-1
- The feeder to the UPS
- Existing 500 kW UPS
- The feeder to the UPS output transformer
- 500 kVA UPS output transformer
- The transformers output circuit breaker.

Also, the standby generator system has a number of single points of failure as follows:

- The 1000 kW standby generator
- The feeder to the emergency distribution panel
- The emergency distribution panel EDS
- The feeder to ATS-4.

In addition, the data center CRAC units and cooling water pumps are all connected to the same switchboard and transformer which represent another single point of failure.

Recommendations to improve reliability.

Because there are basically two transformers presently serving the data center, it would make sense to connect various load types so that some were connected to one transformer and some were connected to the other in order to eliminate a single point failure if transformer, generator or switchboard failure.

This can be accomplished as follows:

1. Install a new 500 kW UPS connected to switchboard #4. Provide new 480-120/208 volt transformer and new UPS distribution switchgear. For a One Line Diagram of this work see attached sketch ESK2.

2. Disconnect existing PDU-B from the existing UPS transformer and reconnect to the new UPS distribution switchgear. For a One Line Diagram of this work see attached sketch ESK1.

3. Install a new distribution panel for data center CRAC units. This distribution panel will be connected to switchboard #2 and will require a new ATS to connect to the standby generator associated with switchboard #2. Reconnect approximately half the existing CRAC units to this new distribution panel. In addition, a cooling water circulating pump will be reconnected to this new distribution panel. This will eliminate the single point of failure if switchboard #4 or its transformer fails. For a One Line Diagram of this work see attached sketch ESK1

4. *Installation of two new PDU's.*

This arrangement would place approximately half the load on each of the two existing switchboards, transformers, and generators and eliminate all of the single points of failure associated with the existing distribution system.

The estimated cost to perform this work is *$1,207,995*. This cost does not include escalation.

For a layout drawing showing proposed equipment location see attached sketch ESK10 and ESK12.

Future load increase

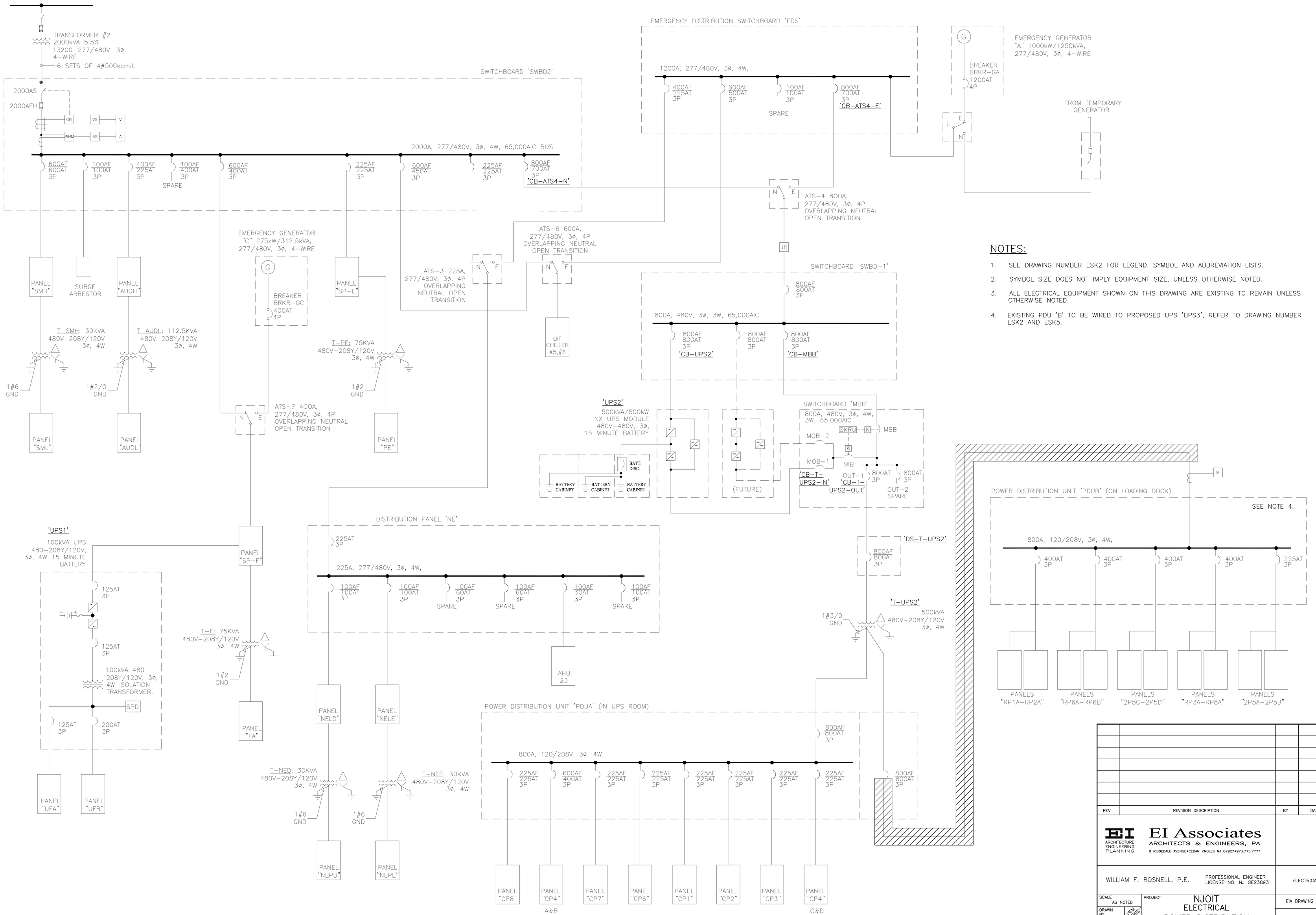
To increase the capacity of the existing data center power distribution system the following is recommended:

1. Add a second 500 kW module to the existing UPS. Add a second 480 -120/208 volt transformer and add a new PDU. For a One Line Diagram of this work see attached sketch ESK4.

2. Add a second 500 kW module to the new UPS. Add a second 480 -120/208 volt transformer and add a new PDU. For a One Line Diagram of this work see attached sketch ESK5.

The estimated cost to improve reliability and increase future capacity will be determined by a future report. For layouts showing proposed equipment layout see attached sketches ESK11 and ESK13.

APPENDIX



NOTES:

1. SEE DRAWING NUMBER ESK2 FOR LEGEND, SYMBOL AND ABBREVIATION LISTS.
2. SYMBOL SIZE DOES NOT IMPLY EQUIPMENT SIZE, UNLESS OTHERWISE NOTED.
3. ALL ELECTRICAL EQUIPMENT SHOWN ON THIS DRAWING ARE EXISTING TO REMAIN UNLESS OTHERWISE NOTED.
4. EXISTING PDU 'B' TO BE WIRED TO PROPOSED UPS 'UPS3', REFER TO DRAWING NUMBER ESK2 AND ESK5.

EXISTING SWITCHBOARD 'SWBD–2' ONE–LINE DIAGRAM–DEMOLITION

NTS

1 / ESK1

REV	REVISION DESCRIPTION	BY	DATE

EI ARCHITECTURE ENGINEERING PLANNING
EI Associates
ARCHITECTS & ENGINEERS, PA
8 RIDGEDALE AVENUE•CEDAR KNOLLS NJ 07927•973.775.7777

WILLIAM F. ROSNELL, P.E.
PROFESSIONAL ENGINEER
LICENSE NO. NJ GE23893

ELECTRICAL

SCALE: AS NOTED
DRAWN BY: HDM
DESIGNED BY: HDM
CHECKED BY: WFR
APPROVED BY:
PROJECT MANAGER:

PROJECT
NJOIT
ELECTRICAL
POWER DISTRIBUTION
OPTIMIZATION
1200 NEGRON DRIVE
HAMILTON NEW JERSEY

TITLE
EXISTING SWITCHBOARD
'SWBD–2' ONE LINE
DIAGRAM–DEMOLITION

EIA DRAWING NO.
ESK1
CLIENT DWG. NO.
EIA PROJECT NO.
EG7768.00

XX

LEGEND AND SYMBOL LIST

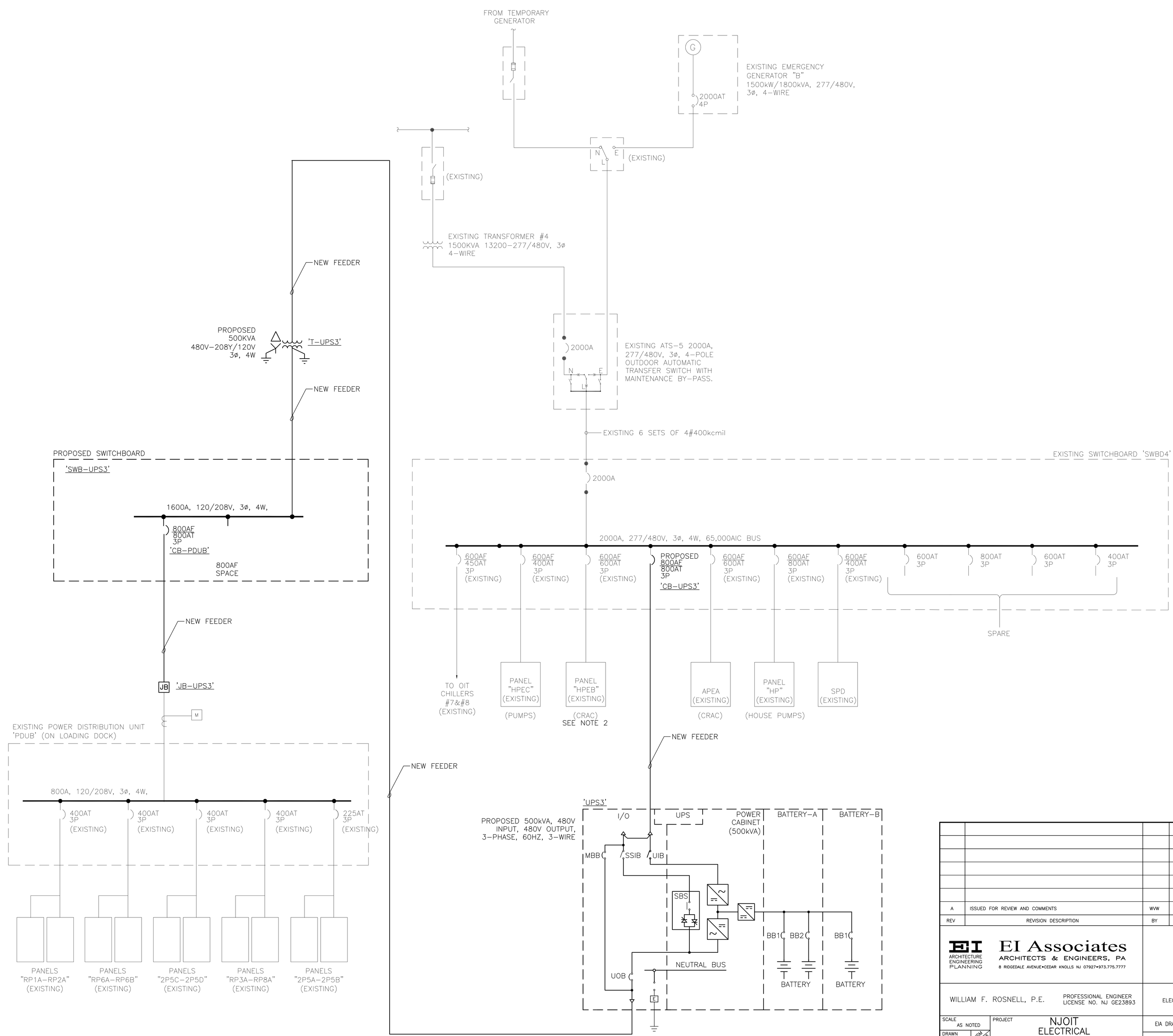
- CURRENT TRANSFORMER
- OR — DISCONNECT SWITCH
- OR — FUSE
- OR — 400AF / 350AT — CIRCUIT BREAKER 3-POLE 80% RATED UNLESS OTHERWISE NOTED. 400AF= BREAKER FRAME SIZE. 350AT = BREAKER TRIP SIZE
- GROUND
- DRAW-OUT
- BATTERY
- BUSBAR LINK
- NORMALLY OPEN CONTACT
- (K) KEY OPERATED
- (E) ELECTRICALLY OPERATED
- [M] SUB-METER
- DELTA TRANSFORMER WINDING CONFIGURATION
- GROUNDED WYE TRANSFORMER WIRING CONFIGURATION
- TRANSFORMER
- [JB] JUNCTION BOX
- CONVERTER
- INVERTER
- DC-DC CONVERTER
- BYPASS SSW
- TERMINATION POINT
- DEMOLITION WORK
- HEAVY LINE DENOTES NEW WORK
- LIGHT LINE DENOTES EXISTING TO REMAIN

ABBREVIATIONS

BB	BATTERY BREAKER
CRAC	COMPUTER ROOM AIR CONDITION
MBB	MAINTENANCE BYPASS BRAEKER
SSIB	STATIC SWITCH INPUT SWITCH
UIB	UNIT INPUT SWITCH
UOB	UNIT OUTPUT BREAKER
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUTIPLE POWER SYSTEM
XFMR	TRANSFORMER

NOTES:

1. SYMBOL SIZE DOES NOT IMPLY EQUIPMENT SIZE, UNLESS OTHERWISE NOTED.
2. EXISTING CRAC UNITS CURRENTLY WIRED SHALL BE DISTRIBUTED BETWEEN EXSITING PANEL HPEB AND PROPOSED PANEL HPEBA, FOR POWER SUPPLY RELIABILITY. SEE DRAWING NUMBER ESK3 FOR PROPOSED PANEL HPEBA.
3. SEE DRAWING NUMBER ESK10 FOR PROPOSED ELECTRICAL EQUIPMENT LOCATION.



EXISTING SWITCHBOARD 'SWBD-4' REVISED ONE-LINE DIAGRAM - UPS RELIABILITY

NTS

1 / ESK2

REV	REVISION DESCRIPTION	BY	DATE
A	ISSUED FOR REVIEW AND COMMENTS	WW	27 MAR 15

EI ARCHITECTURE ENGINEERING PLANNING
EI Associates
ARCHITECTS & ENGINEERS, PA
8 RIDGEDALE AVENUE•CEDAR KNOLLS NJ 07927•973.775.7777

WILLIAM F. ROSNELL, P.E. PROFESSIONAL ENGINEER LICENSE NO. NJ GE23893

ELECTRICAL

SCALE: AS NOTED
DRAWN BY: WW — FROM REPORTS
DESIGNED BY: WW — FROM REPORTS
CHECKED BY: WW — SUBMITTS
APPROVED BY:
PROJECT MANAGER:

PROJECT: NJOIT ELECTRICAL POWER DISTRIBUTION OPTIMIZATION
1200 NEGRON DRIVE
HAMILTON NEW JERSEY

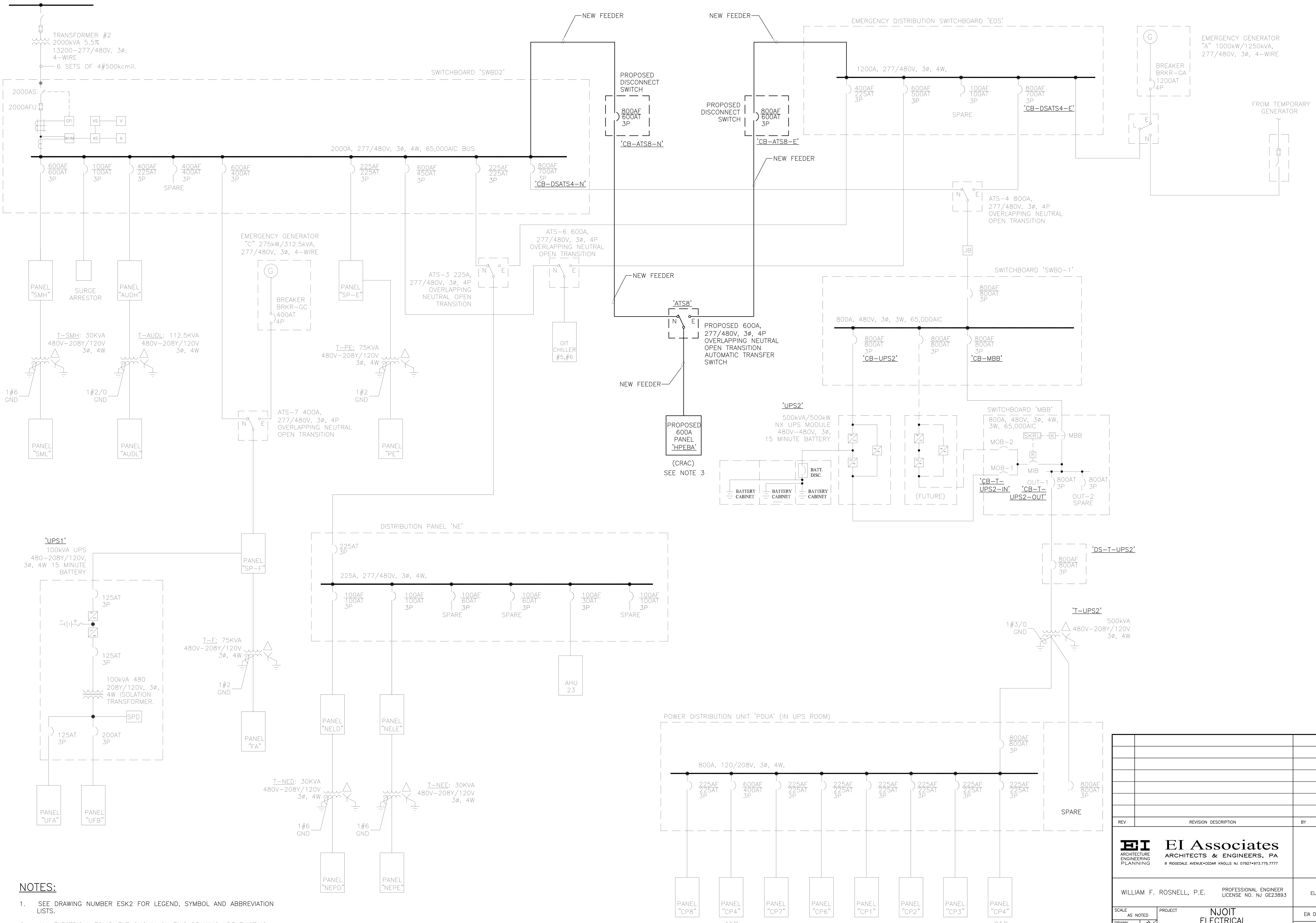
TITLE: EXISTING SWITCHBOARD 'SWBD-4' REVISED ONE LINE DIAGRAM-UPS RELAIBILITY

EIA DRAWING NO.: ESK2

CLIENT DWG. NO.: - - - - -

EIA PROJECT NO.: EG7768.00

XX



NOTES:

1. SEE DRAWING NUMBER ESK2 FOR LEGEND, SYMBOL AND ABBREVIATION LISTS.
2. ALL ELECTRICAL EQUIPMENT SHOWN ON THIS DRAWING ARE EXISTING TO REMAIN UNLESS OTHERWISE NOTED.
3. PROPOSED PANEL FOR DATA CENTER ROOM RE-DISTRIBUTED EXISTING CRAC UNITS' POWER SUPPLY RELIABILITY.
4. SEE DRAWING NUMBER ESK12 FOR PROPOSED ELECTRICAL EQUIPMENT LOCATION.

EXISTING SWITCHBOARD 'SWBD–2' REVISED ONE–LINE DIAGRAM CRAC UNIT POWER RELIABLITY (1/ESK3)

NTS

REV	REVISION DESCRIPTION	BY	DATE

EI Associates
ARCHITECTURE ENGINEERING PLANNING
ARCHITECTS & ENGINEERS, PA
8 RIDGEDALE AVENUE•CEDAR KNOLLS NJ 07927•973.775.7777

WILLIAM F. ROSNELL, P.E. — PROFESSIONAL ENGINEER LICENSE NO. NJ GE23893 — ELECTRICAL

SCALE	AS NOTED
DRAWN BY:	HSM 20FEB15
DESIGNED BY:	HSM 20FEB15
CHECKED BY:	WFR 28MAY15
APPROVED BY:	
PROJECT MANAGER:	

PROJECT: NJOIT ELECTRICAL POWER DISTRIBUTION OPTIMIZATION
1200 NEGRON DRIVE
HAMILTON — NEW JERSEY

TITLE: EXISTING SWITCHBOARD 'SWBD–2' REVISED ONE LINE DIAGRAM – CRAC UNIT POWER RELIABILITY

EIA DRAWING NO.: ESK3

CLIENT DWG. NO.: – – – – –

EIA PROJECT NO.: EG7768.00

XX

NOTES:

1. SEE DRAWING NUMBER ESK5 FOR LEGEND, SYMBOL AND ABBREVIATION LISTS.
2. ALL ELECTRICAL EQUIPMENT SHOWN ON THIS DRAWING ARE EXISTING TO REMAIN UNLESS OTHERWISE NOTED.
3. PROPOSED PANEL FOR DATA CENTER ROOM RE-DISTRIBUTED EXISTING CRAC UNITS' POWER SUPPLY FOR POWER RELIABILITY.
4. SEE DRAWING NUMBER ESK12 AND ESK13 FOR PROPOSED ELECTRICAL EQUIPMENT LOCATION.

EXISTING SWITCHBOARD 'SWBD-2' REVISED ONE-LINE DIAGRAM – UPS POWER RELIABILITY AND EXPANSION (1/ESK4)
NTS

REV	REVISION DESCRIPTION	BY	DATE

EI Associates
ARCHITECTS & ENGINEERS, PA
ARCHITECTURE ENGINEERING PLANNING
8 RIDGEDALE AVENUE•CEDAR KNOLLS NJ 07927•973.775.7777

WILLIAM F. ROSNELL, P.E. PROFESSIONAL ENGINEER LICENSE NO. NJ GE23893

ELECTRICAL

SCALE AS NOTED	PROJECT: NJOIT ELECTRICAL POWER DISTRIBUTION OPTIMIZATION, 1200 NEGRON DRIVE, HAMILTON, NEW JERSEY	EIA DRAWING NO. ESK4
DRAWN BY: HSM 20FEB15		
DESIGNED BY: HSM 20FEB15		
CHECKED BY: WFR 28MAY15		
APPROVED BY:	TITLE: EXISTING SWITCHBOARD 'SWBD-2' REVISED ONE LINE DIAGRAM – UPS POWER RELIABILITY & EXPANSION	CLIENT DWG. NO. – – – – –
PROJECT MANAGER:		EIA PROJECT NO. EG7768.00

XX

LEGEND AND SYMBOL LIST

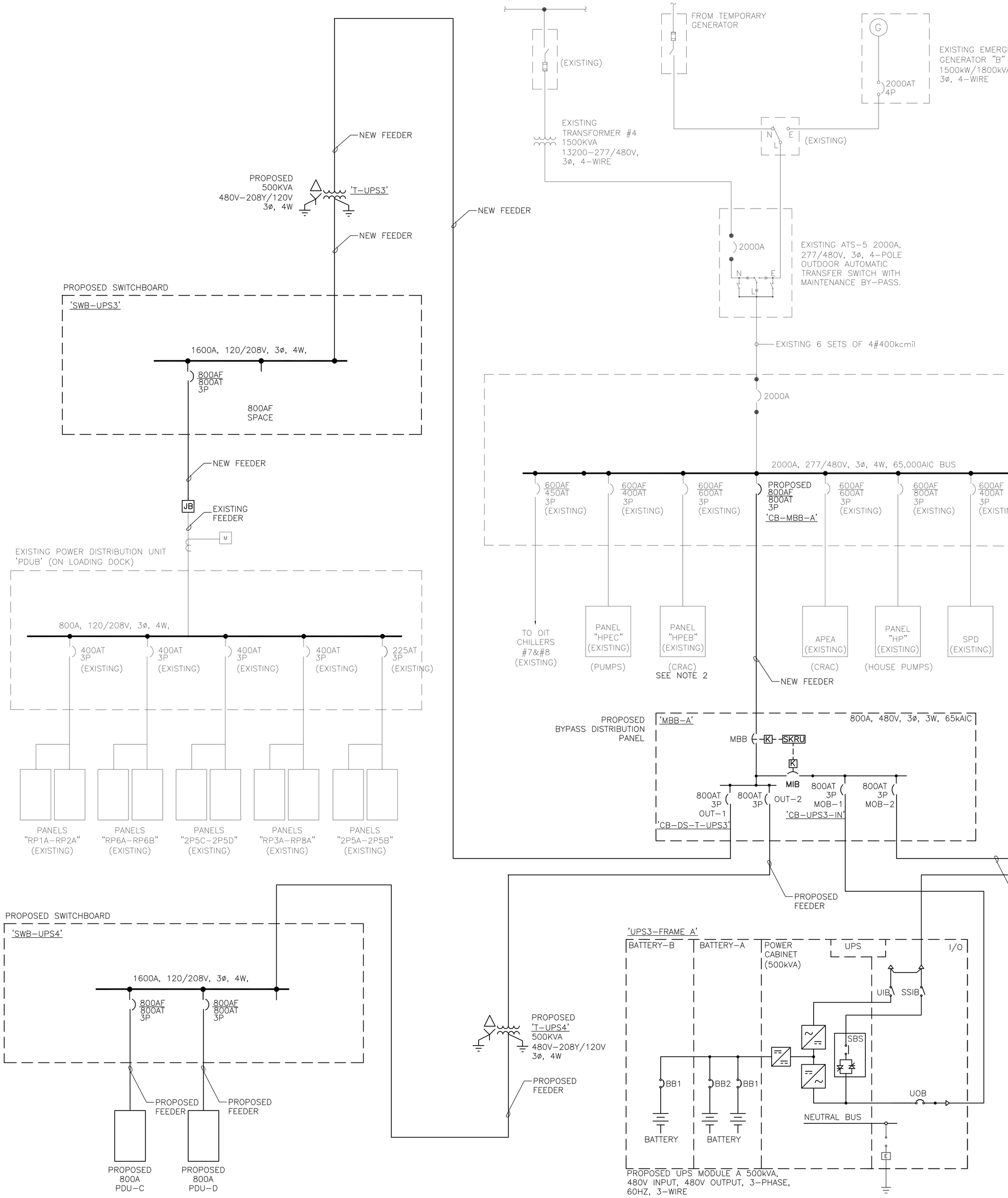
- CURRENT TRANSFORMER
- OR — DISCONNECT SWITCH
- OR — FUSE
- OR — 400AF / 350AT — CIRCUIT BREAKER 3-POLE 80% RATED UNLESS OTHERWISE NOTED. 400AF= BREAKER FRAME SIZE. 350AT = BREAKER TRIP SIZE
- GROUND
- DRAW-OUT
- BATTERY
- BUSBAR LINK
- NORMALLY OPEN CONTACT
- (K) KEY OPERATED
- (E) ELECTRICALLY OPERATED
- [M] SUB-METER
- DELTA TRANSFORMER WINDING CONFIGURATION
- GROUNDED WYE TRANSFORMER WIRING CONFIGURATION
- TRANSFORMER
- CONVERTER
- INVERTER
- DC-DC CONVERTER
- BYPASS SSW
- TERMINATION POINT
- DEMOLITION WORK
- HEAVY LINE DENOTES NEW WORK
- LIGHT LINE DENOTES EXISTING TO REMAIN

ABBREVIATIONS

BB	BATTERY BREAKER
CRAC	COMPUTER ROOM AIR CONDITION
MBB	MAINTENANCE BYPASS BRAEKER
SSIB	STATIC SWITCH INPUT SWITCH
UIB	UNIT INPUT SWITCH
UOB	UNIT OUTPUT BREAKER
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUTIPLE POWER SYSTEM
XFMR	TREANSFORMER

NOTES:

1. SYMBOL SIZE DOES NOT IMPLY EQUIPMENT SIZE, UNLESS OTHERWISE NOTED.
2. EXISTING CRAC UNITS CURRENTLY WIRED SHALL BE DISTRIBUTED BETWEEN EXSITING PANEL HPEB AND PROPOSED PANEL HPEBA, FOR POWER SUPPLY RELIABILITY. SEE DRAWING NUMBER ESK3 FOR PROPOSED PANEL HPEBA.
3. UTILIZE 800A SPARE CIRCUIT BREAKER.
4. REPLACE EXISTING BREAKER WITH 800A, 277/480V, 3-POLE, 65kAIC TO MATCH AND COMPATIBLE WITH EXISTING SWITCHBOARD. PROVIDE MISCELLANEOUS APPROVED HARDWARES AND ACCESSORIES AS REQUIRED. RETURN REMOVED SPARE BREAKER WITH THE OWNER.
5. SEE DRAWING NUMBER ESK11 FOR PROPOSED ELECTRICAL EQUIPMENT LOCATION.



EXISTING SWITCHBOARD 'SWBD-4' REVISED ONE-LINE DIAGRAM - UPS POWER RELIABILITY AND EXPANSION

NTS

1 ESK5

REV	REVISION DESCRIPTION	BY	DATE
A	ISSUED FOR REVIEW AND COMMENTS	WW	27 MAR 15

EI ARCHITECTURE ENGINEERING PLANNING

EI Associates
ARCHITECTS & ENGINEERS, PA
8 RIDGEDALE AVENUE•CEDAR KNOLLS NJ 07927•973.775.7777

WILLIAM F. ROSNELL, P.E. PROFESSIONAL ENGINEER LICENSE NO. NJ GE23893

ELECTRICAL

SCALE: AS NOTED
DRAWN BY: WW
DESIGNED BY: WW
CHECKED BY: WFR
APPROVED BY:
PROJECT MANAGER:

PROJECT
NJOIT
ELECTRICAL
POWER DISTRIBUTION
OPTIMIZATION
1200 NEGRON DRIVE
HAMILTON NEW JERSEY

EIA DRAWING NO.
ESK5

TITLE
EXISTING SWITCHBOARD 'SWBD-4' REVISED ONE LINE DIAGRAM - UPS POWER RELIABILITY & EXPANSION

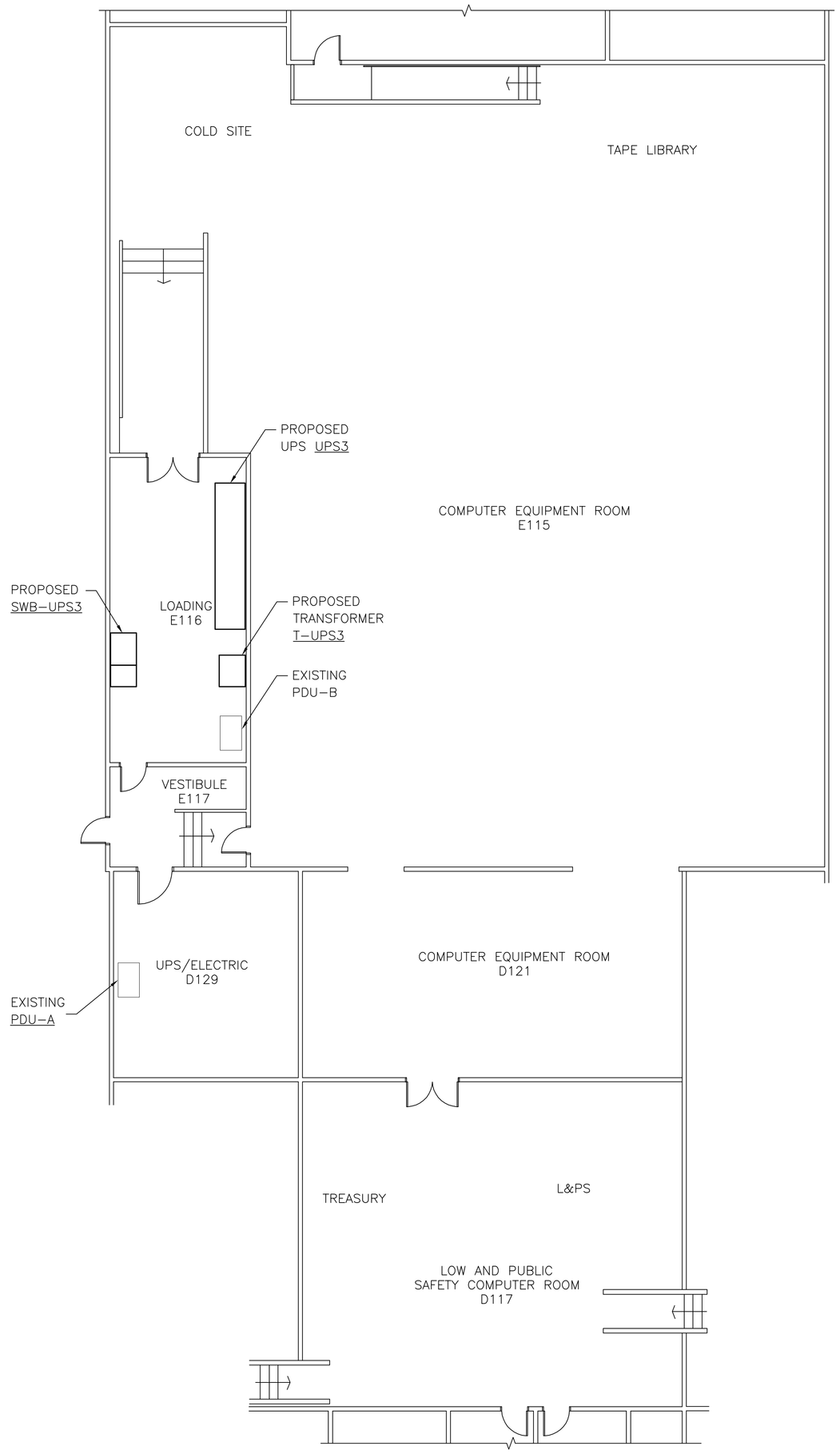
CLIENT DWG. NO.

EIA PROJECT NO.
EG7768.00

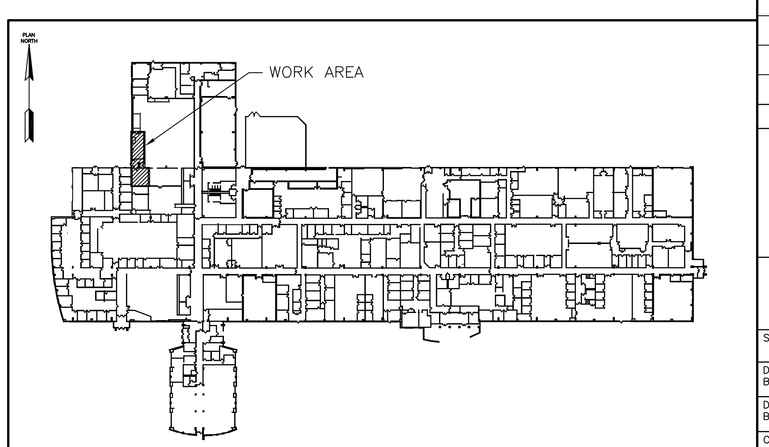
PLAN NORTH
TRUE NORTH

NOTES:

1. SEE DRAWING NUMBER ESK2 FOR LEGEND, SYMBOL AND ABBREVIATION LISTS.
2. SEE DRAWING NUMBER ESK2 ONE–LINE DIAGRAM FOR PROPOSED EQUIPMENT WIRING CONNECTIONS.



PARTIAL FLOOR PLAN – UPS POWER RELIABILITY (1 / ESK10)
1/8" = 1'–0"



KEY PLAN
N.T.S

REV	REVISION DESCRIPTION	BY	DATE

EI Associates
ARCHITECTS & ENGINEERS, PA
ARCHITECTURE ENGINEERING PLANNING
8 RIDGEDALE AVENUE•CEDAR KNOLLS NJ 07927•973.775.7777

WILLIAM F. ROSNELL, P.E. — PROFESSIONAL ENGINEER LICENSE NO. NJ GE23893

ELECTRICAL

SCALE: AS NOTED
DRAWN BY: HSM 10/19/07
DESIGNED BY: HSM 10/19/07
CHECKED BY: WFR 10/19/07
APPROVED BY:
PROJECT MANAGER:

PROJECT
NJOIT
ELECTRICAL
POWER DISTRIBUTION
OPTIMIZATION
1200 NEGRON DRIVE
HAMILTON NEW JERSEY

TITLE
PARTIAL FLOOR PLAN –
UPS POWER RELIABILITY

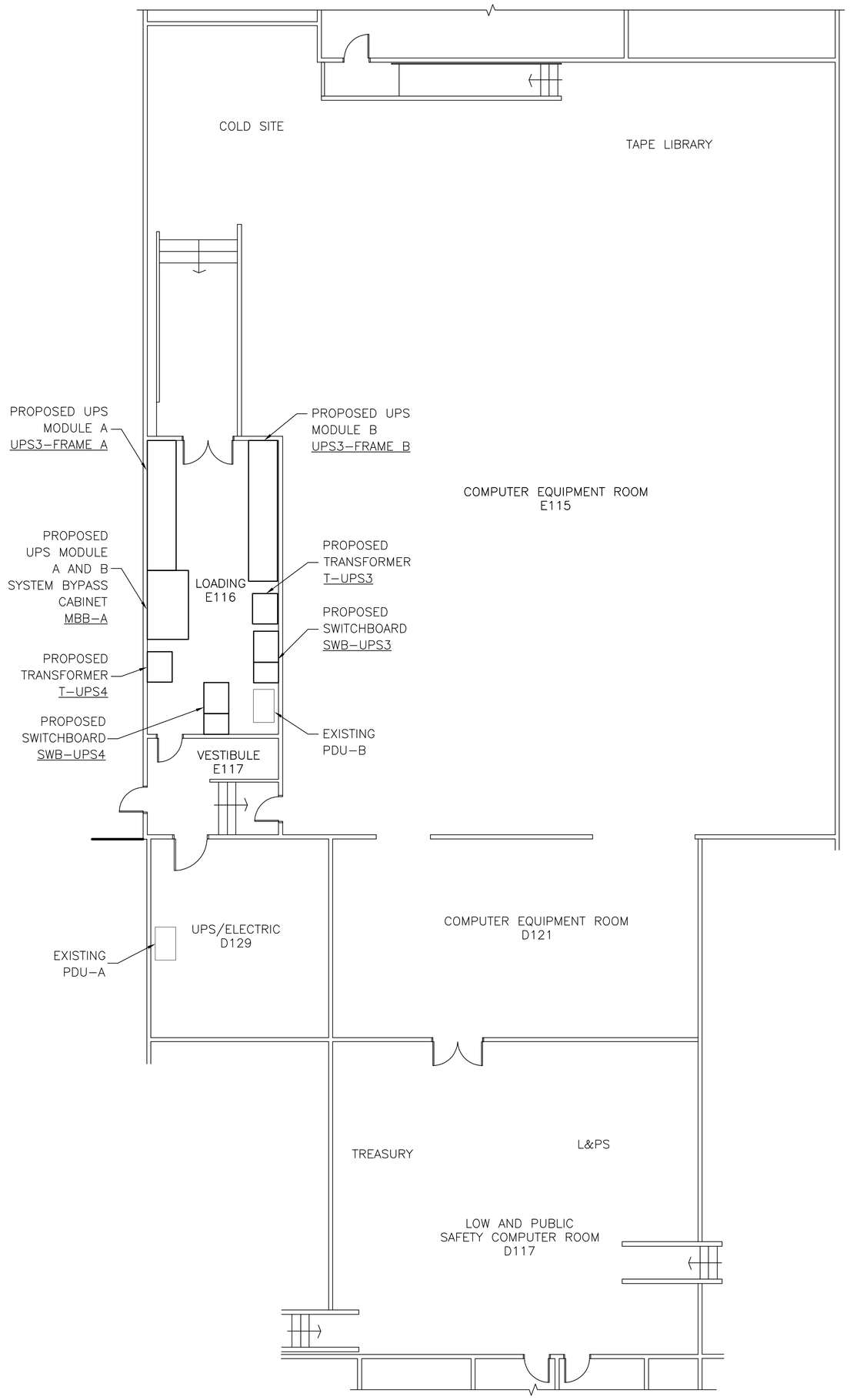
EIA DRAWING NO.
ESK10
CLIENT DWG. NO.
– – – – –
EIA PROJECT NO.
EG7768.00

XX

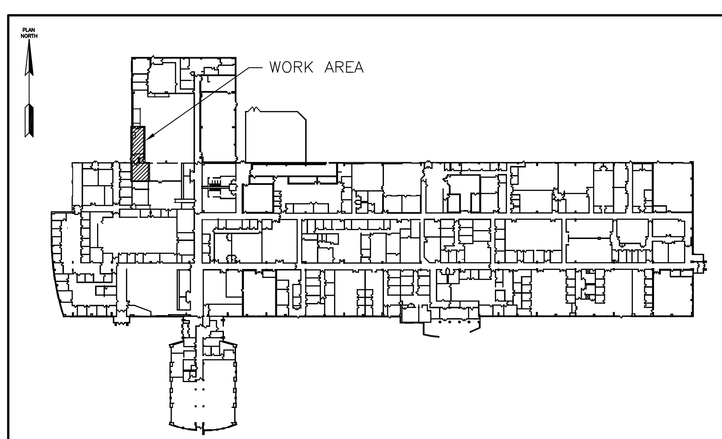
PLAN NORTH
TRUE NORTH

NOTES:

1. SEE DRAWING NUMBER ESK2 FOR LEGEND, SYMBOL AND ABBREVIATION LISTS.
2. SEE DRAWING NUMBER ESK5 ONE–LINE DIAGRAM FOR PROPOSED EQUIPMENT WIRING CONNECTIONS.



PARTIAL FLOOR PLAN – UPS POWER RELIABILITY AND EXPANSION (1 / ESK17)
1/8" = 1'–0"



KEY PLAN
N.T.S

REV	REVISION DESCRIPTION	BY	DATE

EI ARCHITECTURE ENGINEERING PLANNING
EI Associates
ARCHITECTS & ENGINEERS, PA
8 RIDGEDALE AVENUE•CEDAR KNOLLS NJ 07927•973.775.7777

WILLIAM F. ROSNELL, P.E. PROFESSIONAL ENGINEER LICENSE NO. NJ GE23893

ELECTRICAL

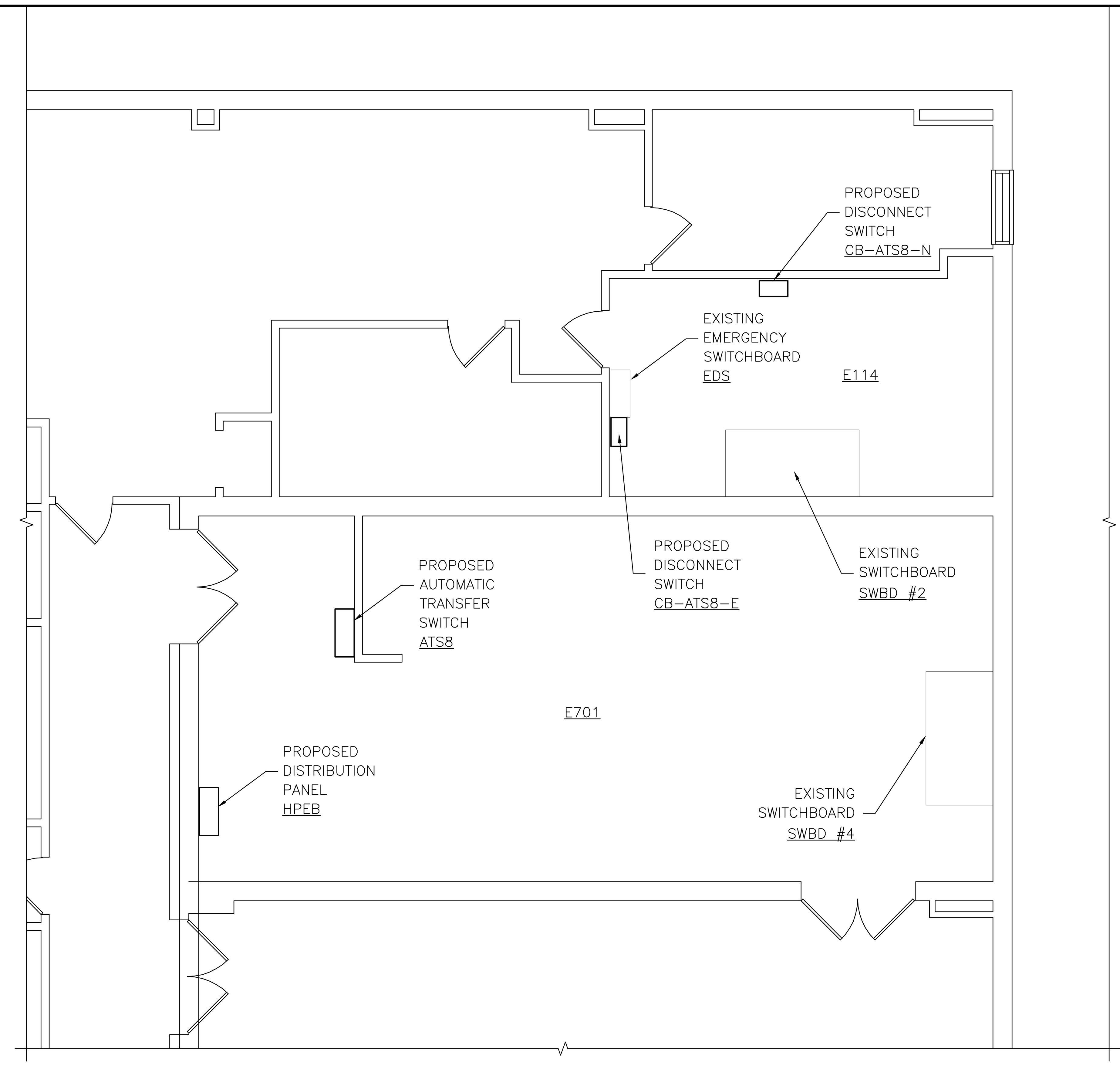
SCALE	AS NOTED
DRAWN BY:	VGM 02/08/07
DESIGNED BY:	VGM 02/08/07
CHECKED BY:	WFR 2/08/07
APPROVED BY:	
PROJECT MANAGER:	

PROJECT
NJOIT
ELECTRICAL
POWER DISTRIBUTION
OPTIMIZATION
1200 NEGRON DRIVE
HAMILTON NEW JERSEY

TITLE
PARTIAL FLOOR PLAN – UPS POWER RELIABILITY AND EXPANSION

EIA DRAWING NO.
ESK11
CLIENT DWG. NO.
– – – – –
EIA PROJECT NO.
EG7768.00

XX

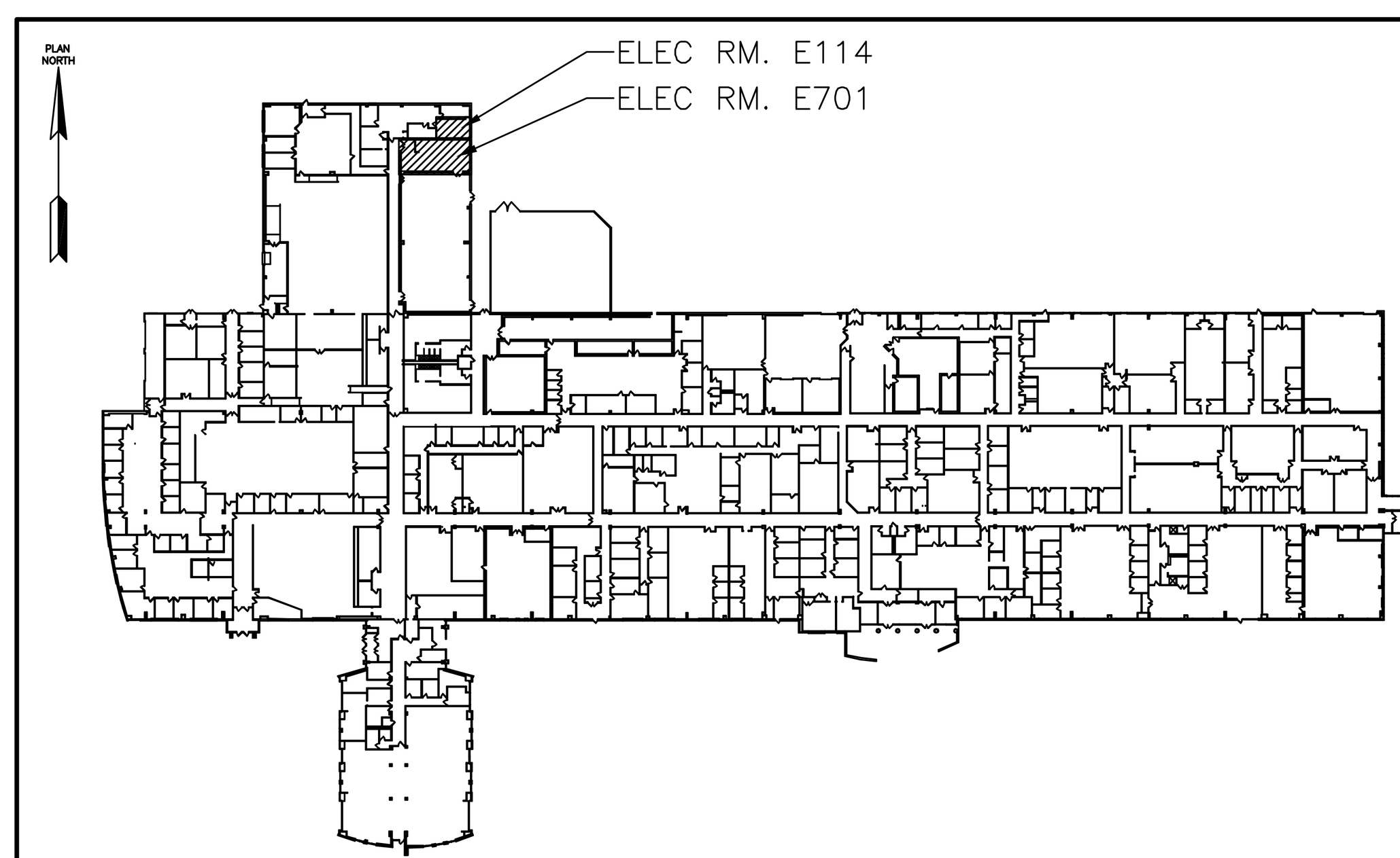


EXISTING ELECTRIC ROOMS E114 AND E701 FLOOR PLAN – CRAC UNITS POWER RELIABILITY (1/ESK11)
1/4" = 1'-0"

NOTES:

1. SEE DRAWING NUMBER ESK2 FOR LEGEND, SYMBOL AND ABBREVIATION LISTS.
2. SEE DRAWING NUMBERS ESK3 AND ESK4, ONE-LINE DIAGRAM, FOR PROPOSED EQUIPMENT WIRING CONNECTIONS.

PLAN NORTH TRUE NORTH



KEY PLAN
N.T.S

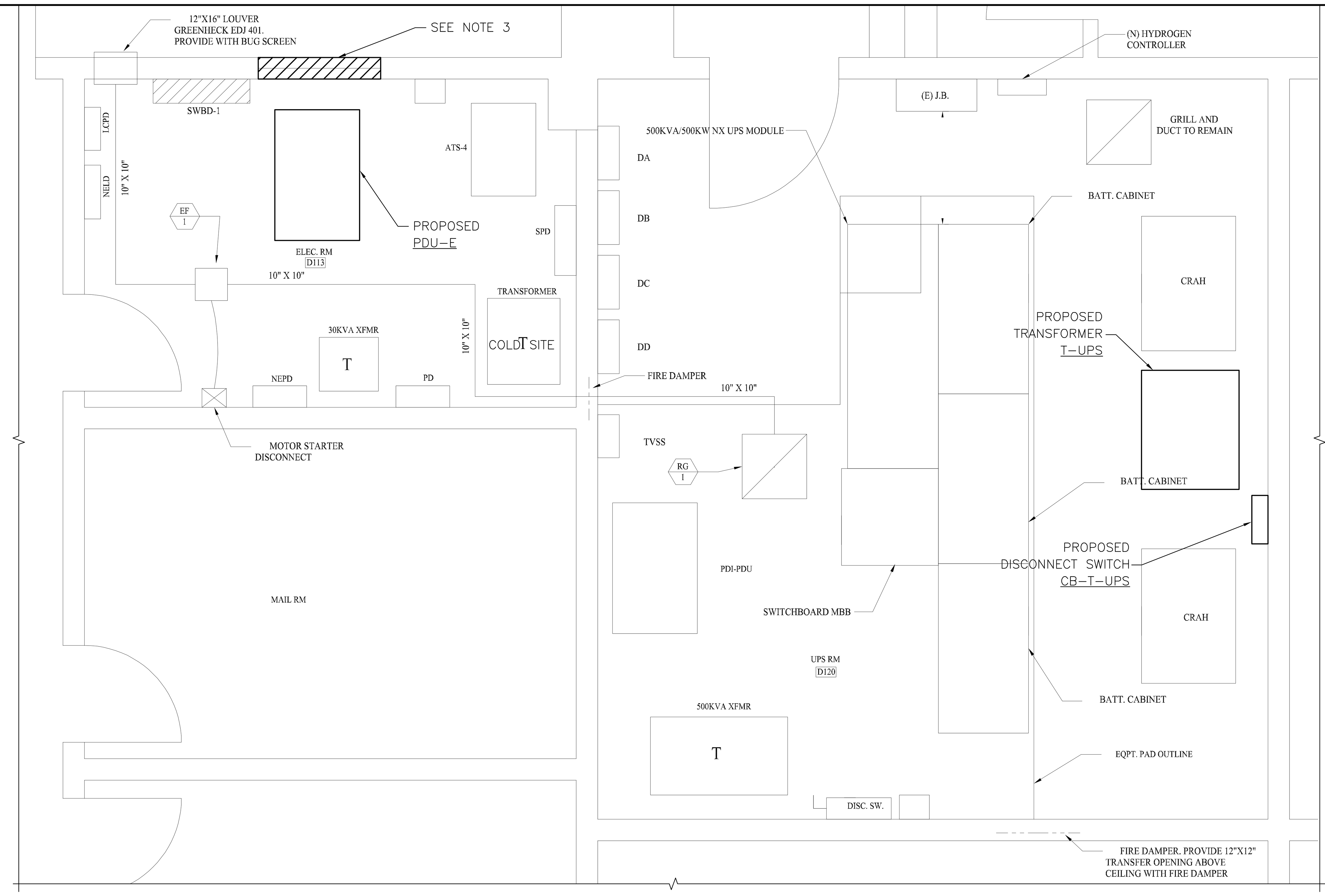
REV	REVISION DESCRIPTION	BY	DATE

EI Associates
ARCHITECTURE ENGINEERING PLANNING
ARCHITECTS & ENGINEERS, PA
8 RIDGEDALE AVENUE•CEDAR KNOLLS NJ 07927•973.775.7777

WILLIAM F. ROSNELL, P.E. PROFESSIONAL ENGINEER LICENSE NO. NJ GE23893 — ELECTRICAL

SCALE AS NOTED	PROJECT NJOIT ELECTRICAL POWER DISTRIBUTION OPTIMIZATION 1200 NEGRON DRIVE HAMILTON NEW JERSEY	EIA DRAWING NO. ESK12
DRAWN BY: HSM 20FEB15		
DESIGNED BY: HSM 20FEB15		
CHECKED BY: WFR 28MAY15		
APPROVED BY:	TITLE EXISTING ELECTRIC ROOMS E114 & E701 FLOOR PLANS – CRAC UNITS POWER RELIABILITY	CLIENT DWG. NO. – – – – –
PROJECT MANAGER:		EIA PROJECT NO. EG7768.00

XX



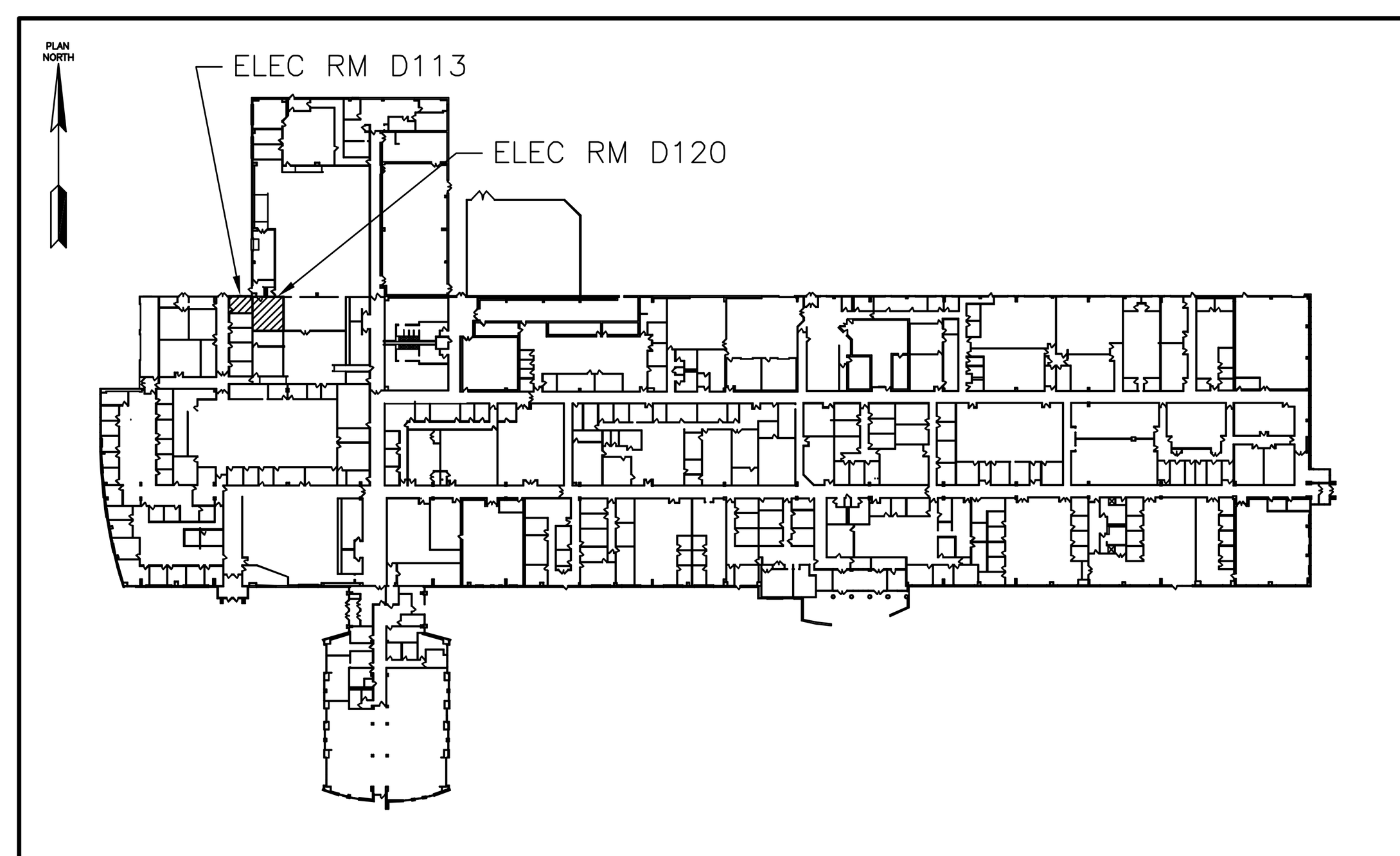
EXISTING ELECTRIC ROOMS D113 AND D120 FLOOR PLAN –UPS POWER RELIABILITUY AND EXPANSION (1/ESK13)

1/2" = 1'-0"

PLAN NORTH
TRUE NORTH

NOTES:

1. SEE DRAWING NUMBER ESK2 FOR LEGEND, SYMBOL AND ABBREVIATION LISTS.
2. SEE DRAWING NUMBER ESK5 ONE–LINE DIAGRAM FOR FROPOSED ELECTRICAL EQUIPMENT CONNECTIONS.
3. ELECTRICAL ROOM ACCESS TO BE CLOSED.



KEY PLAN
N.T.S

REV	REVISION DESCRIPTION	BY	DATE

EI Associates
ARCHITECTURE ENGINEERING PLANNING
ARCHITECTS & ENGINEERS, PA
8 RIDGEDALE AVENUE•CEDAR KNOLLS NJ 07927•973.775.7777

WILLIAM F. ROSNELL, P.E. PROFESSIONAL ENGINEER LICENSE NO. NJ GE23893

ELECTRICAL

SCALE AS NOTED	PROJECT NJOIT ELECTRICAL POWER DISTRIBUTION OPTIMIZATION 1200 NEGRON DRIVE	EIA DRAWING NO. ESK13
DRAWN BY: HSM 20FEB15		
DESIGNED BY: HSM 20FEB15		
CHECKED BY: WFR 28MAY15	HAMILTON NEW JERSEY	
APPROVED BY:	TITLE EXISTING ELECTRIC ROOMS D113 & D120 FLOOR PLAN – UPS POWER RELIABILITY AND EXPANSION	CLIENT DWG. NO. – – – – –
PROJECT MANAGER:		EIA PROJECT NO. EG7768.00

XX

Estimate No. EG7768.00

Job: NJOIT-Hamilton, NJ — Sheet No. 1 of 5

Work: Electrical Configuration & Connections-Reliability Scale: ------ Estimator: — Date: 09/08/15

CONSTRUCTION COST ESTIMATION

		A		B	C		D
a	Sheet 2 of 5			$311,790.00			420.68
b	Sheet 3 of 5			$126,009.19			729.73
c	Sheet 4 of 5			$28,488.99			479.79
d	Sheet 5 of 5			$32,151.28			213.85
e	Material Cost (B), (a+b+c+d)			$498,439.46			1,844.05
f	Demo work 10% of labor (D), (e), Hours				10	%	184.41
g	Total Labor hours (D), (e+f), Hours						2,028.46
h	Labor cost at $110 per hour (D,g)	$125.00	Hr				$253,557.04
i	Sales Tax for materials (B,e)	0	%	$0.00			
j	Material cost including tax (B), (e+i)			$498,439.46			
k	Construction cost, Material cost plus labor, ((B,j)+(D,h))						$751,996.49
l	Plus Profit, ((B,e) + (D,h))	10	%				$75,199.65
m	Plus Overhead, ((B,e) + (D,h))	10	%				$75,199.65
n	Plus Contingency, (D,k)	20	%				$150,399.30
o	Plus A&E Fees, (D,k)	10	%				$75,199.65
p	Electrical Construction Permit Fee						$20,000.00
	Architectural revisions						$60,000.00
	Reliability Study Total Estimate for New Equipment Const. Budget						**$1,207,994.74**

Estimate No. EG7768.00

Job: NJOIT-Hamilton, NJ

Sheet No. 2 of 5

Work: Electrical Configuration & Connections-Reliability Scale: ------ Estimator: HSM

Date: 09/08/15

Quantity	Description of Items	Material			Labor		
		Unit	Per	Extension	Unit	Per	Extension
	500kVA Indoor UPS						
1	500kVA 480V in-480V out, 6.6 minutes	$228,000.0	Ea	$228,000.00	200	Ea	200
4	#3/0 bare copper termination	$50.00	Ea	$4,800.00	1.06	Ea	4.24
16	600kcmil cable termination	$100.00	Ea	$1,600.00	1.85	Ea	29.6
1	Testing/Commissioning/Training	$15,000.0	LS	$15,000.00			0
	500kVA Indoor Transformer						
1	500kVA 480-208Y/120V Copper dry type	$17,690.0	LS	$17,690.00	38	Ea	38
14	#3/0 bare copper termination	$50.00	Ea	$700.00	1.06	Ea	14.84
40	600kcmil cable termination	$100.00	Ea	$4,000.00	1.85	Ea	74
	Miscellaneous Eqpt						
2	800A, 120/208V, 3-pase indoor PDU	$20,000.00	Ea	$40,000.00	30	Ea	60
				$311,790.00			420.68

Estimate No. EG7768.00

Job: NJOIT-Hamilton, NJ

Sheet No. 3 of 5

Work: Electrical Configuration & Connections-Reliability Scale: ------ Estimator: HSM

Date: 09/08/15

Quantity	Description of Items	Material			Labor		
		Unit	Per	Extension	Unit	Per	Extension
	Miscellaneous Eqpt						
1	1600A, 120/208V, 3-phase, 4-wire indoor Switchge	$53,000.0	LS	$53,000.00	34	Ea	34
2	600A, 480V, 3-pole Indoor Enclosed Circuit Breaker				4	Ea	8
1	600A, 277/480V indoor distribution panel				8	Ea	8
	Wires and Cables						
2900	600kcmil THHN/THWN, copper	$11,690.8	M	$33,903.32	60	M	174
2900	350kcmil THHN/THWN, copper	$6,450.3	M	$18,705.73	48	M	139.2
1300	500kcmil THHN/THWN, copper	$10,470.0	M	$13,610.95	50	M	65
0	4/0 THHN/THWN, copper	$4,420.5	M	$0.00	36.2	M	0
0	3/0 THHN/THWN, copper	$3,524.6	M	$0.00	32.5	M	0
450	1/0 THHN/THWN, copper	$2,252.8	M	$1,013.76	27.5	M	12.375
750	1 THHN/THWN, copper	$1,813.3	M	$1,359.98	25	M	18.75
0	2 THHN/THWN, copper	$1,332.3	M	$0.00	22.5	M	0
500	3 THHN/THWN, copper	$270.90	M	$135.45	20	M	10
0	6 THHN/THWN, copper	$554.08	M	$0.00	15	M	0
28	600kcmil termination	$50.00	Ea	$1,400.00	2.4	Ea	67.2
72	350kcmil termination	$30.00	Ea	$2,160.00	1.8	Ea	129.6
24	500kcmil termination	$20.00	Ea	$480.00	1.5	Ea	36
0	4/0 termination	$15.00	Ea	$0.00	1.35	Ea	0
0	3/0 termination	$15.00	Ea	$0.00	1.2	Ea	0
14	1/0 termination	$10.00	Ea	$140.00	0.9	Ea	12.6
20	#1 termination	$5.00	Ea	$100.00	0.75	Ea	15
0	#2 termination	$5.00	Ea	$0.00	0.67	Ea	0
0	#3 termination	$5.00	Ea	$0.00	0.60	Ea	0
0	#6 termination	$5.00	Ea	$0.00	0.45	Ea	0
				$126,009.19			729.725

Estimate No. EG7768.00

Job: NJOIT-Hamilton, NJ

Sheet No. 4 of 5

Work: Electrical Configuration & Connections-Reliability Scale: ------ Estimator: HSM

Date: 09/08/15

Quantity	Description of Items	Material			Labor		
		Unit	Per	Extension	Unit	Per	Extension
	Conduits & Fittings						
1200	3 1/2" EMT conduit	$582.00	C	$6,984.00	16.2	C	194.4
22	3 1/2" EMT connector	$47.4	Ea	$1,043.68	0.87	Ea	19.14
136	3 1/2" EMT couplings	$60.1	Ea	$8,170.88	0.87	Ea	118.32
22	3 1/2" EMT plastic bushing	$813.0	C	$178.86	0.3	Ea	6.6
10	3 1/2" EMT elbow	$63.8	Ea	$637.80	2.1	Ea	21
3	3 1/2" EMT LB condulet	$352.5	Ea	$1,057.53	2.35	Ea	7.05
2	24" X 24" X 6" pull box	$164.9	Ea	$329.70	5	Ea	10
0	3" EMT conduit	$445.20	C	$0.00	13.7	C	0
0	3" EMT connector	$29.83	Ea	$0.00	0.75	Ea	0
0	3" EMT couplings	$35.1	Ea	$0.00	0.75	Ea	0
0	3" EMT plastic bushing	$613.0	C	$0.00	0.87	Ea	0
0	3" EMT elbow	$47.6	Ea	$0.00	1.74	Ea	0
0	3" EMT LB condulet	$176.05	Ea	$0.00	2	Ea	0
0	24" X 24" X 6" pull box	$164.9	Ea	$0.00	1.6	Ea	0
800	2 1/2" EMT conduit	$346.80	C	$2,774.40	11.8	C	94.4
30	2 1/2" EMT connector	$23.3	Ea	$700.20	0.62	Ea	0.0186
134	2 1/2" EMT couplings	$28.1	Ea	$3,758.70	0.62	Ea	0.08308
30	2 1/2" EMT plastic bushing	$577.0	C	$173.10	0.3	Ea	0.009
22	2 1/2" EMT elbow	$31.9	Ea	$702.24	1.5	Ea	0.033
6	2 1/2" EMT LB condulet	$132.2	Ea	$793.20	1.75	Ea	0.0105
6	24" X 24" X 6" pull box	$164.9	Ea	$989.10	5	Ea	0.03
100	1 1/2" EMT conduit	$195.60	C	$195.60	8.7	C	8.7
0	1 1/2" EMT connector	$12.50	Ea	$0.00	0.37	Ea	0
0	1 1/2" EMT couplings	$10.52	Ea	$0.00	0.37	Ea	0
0	1 1/2" EMT plastic bushing	$144.0	C	$0.00	0.2	Ea	0
0	2 1/2" EMT elbow	$9.44	Ea	$0.00	1	Ea	0
0	1 1/2" EMT LB condulet	$40.94	Ea	$0.00	1.5	Ea	0
0	24" X 24" X 6" pull box	$164.9	Ea	$0.00	5	Ea	0
0	3 1/2" PVC conduit	$271.2	C	$0.00	23	C	0
0	3 1/2" PVC connector	$1,045.7	C	$0.00	0.81	Ea	0
0	3 1/2" PVC couplings	$719.2	C	$0.00	0.81	Ea	0
0	3 1/2" PVC plastic bushing	$813.0	C	$0.00	0.3	Ea	0
0	3 1/2" PVC elbow	$3,819.7	C	$0.00	1.55	Ea	0
0	3 1/2" PVC adaptor	$1,045.7	C	$0.00	0.81	Ea	0
0	3 1/2" PVC LB condulet	$8,764.9	C	$0.00	2	Ea	0
0	3 1/2" PVC expansion fitting	$7,182.8	C	$0.00	1.85	Ea	0
0	12" X 18" X 6" PVC J/Box	$81.4	Ea	$0.00	5	Ea	0
				$28,488.99			479.7942

Estimate No. EG7768.00

Job: NJOIT-Hamilton, NJ

Sheet No. 5 of 5

Work: Electrical Configuration & Connections-Reliability Scale: ------ Estimator: HSM

Date: 09/08/15

Quantity	Description of Items	Material			Labor		
		Unit	Per	Extension	Unit	Per	Extension
	Supports & Hardwares						
24	12' Pre-cut channel	$20.0	Ea	$480.00	13.7	C	3.288
48	48" Pre-cut hanger rod	$12.9	Ea	$617.28	18.7	C	8.976
100	Up to 4" diaimeter hanger channel conduit clamps	$4.0	Ea	$400.00	7.5	C	7.5
0	Up to 3" diameter hanger channel conduit clamps	$3.0	Ea	$0.00	6.25	C	0
0	Up to 2" diameter hanger channel conduit clamps	$2.0	Ea	$0.00	5	C	0
0	Up to 2" 2-hole strap	$2.9	Ea	$0.00	6.25	C	0
0	Up to 3" 2-hole strap	$2.9	Ea	$0.00	6.85	C	0
50	Up to 4" 2-hole strap	$2.9	Ea	$143.00	7.8	C	3.9
24	3' X 3' Trapeze Hangers without beam clamps				61.2	C	14.688
24	4' X 4' Trapeze Hangers without beam clamps				75	C	18
100	Beam clamps for threaded rods	$5.1	Ea	$511.00	37.5	C	37.5
	ATS						
1	600A, 480V, 3-ph, 4-W ATS/Bypass indoor	$20,000.0	LS	$20,000.00	120	Ea	120
1	Testing/Training	$10,000.0	LS	$10,000.00			
				$32,151.28			213.852